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THE DYNAMICS OF SHOCK AND ITS CLINICAL IMPLICATIONS

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CONFUSION

THE enigma of shock which has baffled physicians for a century, has been studied intensively by all ranks of investigators. These have included both novices and scientists of experience, those bent on vindicating some favored theory and those seeking only valid evidence. Some did not provide adequate controls on major factors of their experiments; others drew conclusions contradictory to their own data. Is it strange, then, that confusion rather than clarification resulted? None of the early theories survived the test of controlled experimentation, yet the net result was an accumulation of factual evidence. The accurate correlation of this evidence became the task of subsequent workers.

The first World War stimulated research which provided significant information. Under the auspices of the British Medical Research Committee, experienced workers made an intensive study of shock resulting from wounds. Surgical experiences combined with experimental studies resulted in the explanation known as *traumatic toxemia*. It is summarized by Cannon (7) as follows:

"The theory of secondary shock which has the strongest support, both in clinical observations and in laboratory experiments, is that of a toxic factor, arising from damaged and dying tissue and operating to cause an increased permeability of the capillary walls and a consequent reduction of blood volume by escape of plasma into the lymph spaces. It is recognized that, after a sufficient time, infection may occur and be of such character in itself as to induce a persistent low blood pressure. According to this theory there may be no essential difference between the effects of toxins given off by damaged tissue and of toxins resulting from activity of bacteria."

This interpretation was widely accepted for it integrated smoothly both with the experiences of surgeons and with what was known of capillary reactions at that time. Then a new theory was proposed which attributed shock entirely to hemorrhage and to loss of fluid in the injured areas. All the accompanying phenomena were explained, to the author's satisfaction, without reference to the effects of toxic substances absorbed from damaged and infected tissues. This theory was so widely publicized that many accepted it as the final solution of the problem. Attention has been directed repeatedly (25, 26, 27, 28) to sources of error inherent in the methods used in support of this theory, and to lack of adequate controls on important experimental factors.

SHOCK VERSUS THE EFFECTS OF HEMORRHAGES

Superficial similarities between shock and the effects of hemorrhages have led to the assumption that the two are identical. Many have based conclusions regarding shock upon the results of simple bleeding, or upon those of trauma accompanied by massive hemorrhages. It appears that no one had made a comparison of the physiological disturbances resulting from these two conditions. Such a comparison was undertaken and the recorded observations of different workers on various features seen in shock and after hemorrhages, respectively, were collected; then each item was verified experimentally (29). The results of these comparisons follow:

Features Identical in Shock and Hemorrhage

1. Sympathoadrenal activity
   a. Stimulation of myocardium
      (1) Strong rapid pulse in early stages

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b. Peripheral vasoconstriction
   (1) Reduced volume flow
   (2) Peripheral ischemia, pallor
   (3) Loss of tissue turgor
c. Discharge of reservoir blood into systemic circulation
   (1) Contraction of spleen
d. Increased blood sugar
e. Dilatation of pupils, often perspiration

2. Low basal metabolism
   a. Declining temperature
3. Decreased alkaline reserve
4. Increased respiratory rate, thirst
5. Low arterial blood pressure (in late stages)
6. Death due to inadequate circulatory function

Because of these similarities, shock and the effects of hemorrhages have been regarded as identical. Other features which have been reported in shock from wounds, burns, intestinal obstruction, anaphylaxis, and from other causes, are tabulated and compared with the same items after simple hemorrhages.

An attempt was made to produce the features recorded under *shock*, with hemorrhages of all degrees and varying duration: with successions of large hemorrhages, ending fatally in from four to eight hours, and with repeated small hemorrhages with death in from one to four days. In every instance, the findings recorded under hemorrhages resulted; in no case did the changes characteristic of shock develop.

It seems remarkable that such numerous and important differences escaped the attention of those who have written voluminously on hemorrhages as the cause for shock. More remarkably, a few even advocate hemorrhages as the method of choice for producing shock experimentally. Let it be emphasized that hemorrhages, when present, are a highly important contributory factor; an animal or person in shock may not survive a minor hemorrhage which under normal conditions would have insignificant effects. However, hemorrhages alone, independent of trauma, anesthesia, or of toxic effects, will not produce the syndrome of shock.

Contrasted Features

Items	Shock	Hemorrhage
Endothelium	Permeable to colloids	Impermeable
Flow of lymph	Increased	Decreased
Tissue fluid	Increased	Decreased
Fluid balance	Disturbed	Undisturbed
Absorption	Impaired	Unimpaired
Vomiting	Persistent	No vomiting
Diarrhea	Frequent	Absent
Saline solutions, intravenous	Ineffective	Often effective
Renal		
Excretion	Deficient	Unimpaired
Urine	Concentrated, low volume, albumin, erythrocytes, bile, debris	No characteristic changes
Blood		
Coagulation time	Lengthened	Shortened
Concentration	Increased	Decreased
Nonprotein nitrogen	Increased	Decreased
Potassium	Increased	Terminal increase
Plasma chlorides	Decreased	Increased
Necropsy findings		
Edema of soft tissues	Characteristic	None
Serous effusions	Present	Absent
Capillovenous congestion	Characteristic	Absent
Petechiae	Characteristic	Absent
Visceral ischemia	Absent	Present
Organ weight	Increased	Decreased
Gastrointestinal tract	Dilated, atonic	Contracted
Parenchymal necroses	Present	Absent

REALISM

The sole objection to the explanation of traumatic toxemia was negative in character, based on the fact that no toxic substances had been shown experimentally or identified chemically in the blood during shock. Presumably, the toxic substances which result from trauma are cleavage products of tissue autolysis or of bacterial action upon tissue proteins. Chemical methods are not yet perfected to identify such substances in the blood, except as nonprotein nitrogen. The latter is markedly increased during shock and is attributed by Whipple, Van Slyke, and others (45) to destruction of the body's proteins. The objection mentioned took no account of these facts nor of the mass of clinical and pharmacological evidence indicating toxic effects.

Recent contributions have been savored with the salt of objective realism. Best and Solandt instituted exchange transfusion of blood between pairs of dogs, in one of which shock was induced by trauma. The untraumatized dogs developed shock as did those which were traumatized. These results were interpreted as indications of the effects of a toxic substance released from injured tissues and conveyed by the blood. Kendrick, Essex, and Helmholz (18) performed a somewhat similar experiment with exchange transfusion which likewise furnished evidence supporting the theory of toxemia. Even those who have opposed vigorously the conception of a toxic factor have now relaxed their opposition. For example, Freeman and his collaborators (14) reported experi-

ments on traumatic shock which they interpreted as indicating the effects of a toxic factor absorbed from the traumatized region. In summarizing the unsolved problems of shock Blalock (4a) assigned first place to the need for information on the nature and sources of the toxic substances.

A co-ordinated attack on the problems of shock was organized by the National Research Council in 1940. Research on various phases was undertaken by diverse methods in medical centers and institutions throughout the country. Two years later the workers met to compare results and to outline further studies. The evidence on toxic factors led to the conclusion that the importance of these must now be recognized, and it was recommended that investigations be directed toward the determination of the sources and the nature of these toxic substances. This report was accepted without dissent. Thus we have witnessed a complete cycle of changing views on shock; we find a well informed group of research workers endorsing the interpretations presented as long as twenty-five years ago.

This view is in agreement with an enormous mass of clinical and experimental data, and it is supported by necropsy findings. A distinctive pattern of pathological changes is seen in the viscera after death by shock. This consists of capillary atony, hyperemia, stasis, edema, and ecchymoses in the lungs, mucosae, serous surfaces and in the liver and kidneys. These changes indicate with certainty the nature of the circulatory disturbances and confirm the evidence of toxic effects.

The recognition of a toxemic factor abolishes the most important subject of dissension. It appears that investigations on other features of shock can now go forward in an atmosphere somewhat cleared of controversial discussions.

TRAUMATIC SHOCK

The term *shock* has been applied to several unrelated conditions. Many regard it as a state of acute circulatory failure characterized by prostration, apathy or stupor, tachycardia, feeble regular pulse, and diminished blood pressure. Used in this sense, shock includes circulatory disturbances having no other features in common; their pathogenesis and disorders of function are various. For example, the effects of syncope, fright, exhaustion, anesthesia, hemorrhage, primary shock, cardiac failure, or of secondary shock conform to this broad application of the term. Low arterial blood pressure may occur in each of these conditions, hence they cannot be differentiated by that criterion.

The attention of surgeons is focused upon shock following trauma. Some of them recognize that at least three mechanisms may cause low blood pressure after injury. One of these, primary or neurogenic shock, is a neurovascular reaction like that of syncope or fainting. This develops promptly after injury and is usually transient unless accompanied by extensive trauma or hemorrhage. Occasionally, primary shock may merge gradually into secondary shock without an interval of partial recovery. Hemoconcentration is not present in primary or neurogenic shock (Phemister, 32).

The effects of hemorrhage are an obvious cause for low blood pressure. This may develop promptly from voluminous hemorrhage or gradually from slow or repeated small hemorrhages. The clinical signs of hemorrhage are like those of secondary shock, but it has been shown that they differ in other important particulars. Hemorrhage is followed by a rapid dilution of the blood which, in otherwise normal subjects, is proportional to the volume of blood lost. Low blood pressure occurring shortly after trauma, is due chiefly to neurovascular and hemorrhagic effects.

The third mechanism results from deranged capillary function. Products of tissue autolysis or of infection, absorbed from damaged tissues, produce systemic effects like those of capillary poisons. Consequent leakage of fluid from the blood into the tissue spaces disturbs fluid balance, lowers the blood volume, and causes hemoconcentration. Decreased blood volume, combined with increased volume capacity of the capillary bed, causes circulatory deficiency. This mechanism requires time for development; it is never seen immediately after injury, hence it is called *delayed* or *secondary* shock.

Several reports of surgical experiences, both here and abroad, indicate confusion in attempting to analyze the causes of low blood pressure resulting from trauma. One such report exemplifies these. Evans and associates (13) made hematocrit and blood-volume determinations in 143 cases of knife wounds, bullet wounds, and accidental injuries. Many of these developed shock as indicated by low blood pressure. Hemodilution was present in the majority; a few showed hemoconcentration. The authors concluded that low arterial pressure is the most useful criterion for shock and that hemorrhage is its most important cause.

The cases described were seen early; there was evidence of extensive hemorrhage which averaged 38 per cent of the estimated blood volume; hence, it is probable that primary shock and hemorrhage were chiefly responsible for the low blood pressure. However, among 63 cases of moderate or

severe shock from skeletal, thoracic, and abdominal injuries, there were 46 instances in which the hematocrit reading was 40 or above. Do the authors believe that hemorrhage was the major factor in these cases? A hematocrit reading of 40 indicates approximately 90 per cent hemoglobin or 4,500,000 erythrocytes. Those who have lost 38 per cent of their blood volume by hemorrhage should show hemodilution of greater degree than this. One suspects that some other mechanism was operating in this group of cases (*vide infra:* hemo-concentration). Evident confusion is expressed in their frank statement: "In his search for truth concerning traumatic toxemia, the reader may become bewildered by some of the writings on the subject."

The reasons for bewilderment are not far to seek. Conditions due to a combination of causes are not suitable for analysis of the mechanisms:

Let X symbolize the effects of primary or neurogenic shock.

Let Y symbolize the effects of hemorrhages—"hemorrhagic" shock.

Let Z symbolize the effects of capillary damage—"toxemic" or secondary shock.

Then X+Y+Z=traumatic shock (low blood pressure as the criterion).

To propose conclusions as to the cause of shock, upon data from cases of traumatic injuries, is as unsafe as to propose the solution of a single equation containing three indeterminate variables.

Circulatory deficiency following trauma may be due to neurogenic reactions, to the effects of hemorrhages, or to absorption of toxic products, or it may be due in part to each. So-called traumatic shock is not a disease entity but a syndrome; it represents the summative effects of several factors. These vary in different cases and in the same case at different times. Obviously, the mechanisms involved in shock from trauma should be studied separately as neurogenic, hemorrhagic, and toxemic factors.

The basic principles on which agreement may be expected are as follows:

Surgical shock, like that resulting from extensive trauma, is not due to a single cause but to a combination of causes: the anesthetic, the local loss of blood and fluid, emotional reactions, infection or intoxication which may have reduced the patient's physiological state, the disease itself (which necessitated operation), and the absorption of toxic products from traumatized tissues. The relative importance of these factors varies in each case and they operate in varying combinations. Some of these factors are lacking in shock from other causes.

It is now recognized that shock is not limited to traumatic injuries, burns, and the aftermath of extensive surgery. I have emphasized repeatedly that the same mechanisms operate in severe infections, metabolic intoxications, abdominal emergencies such as intestinal strangulation, mesenteric thrombosis, perforation, peritonitis, and from the effects of various poisons.

CIRCULATORY DYNAMICS

Space does not permit an analysis of other proposed theories and of the factual evidence which rendered each of them unsupportable. Those interested are referred to recent publications in which these have been examined critically (25, 26).

Students of capillary physiology have supplied a satisfying explanation of the mechanism by which various toxic agents produce circulatory deficiency. Capillary endothelium is delicately susceptible to the effects of various noxious agents and conditions. These include extracts of normal tissues, products of tissue autolysis, foreign proteins and protein-split products, bacterial substances, histamine, bile, venoms, poisons, metabolic products, and even a moderate lack of oxygen. It was established that any kind of injury to endothelium increases its permeability to the plasma colloids. Therefrom other dysfunctions result as shown in the following diagram:

Agents or conditions Injurious to Endothelium	Pathological effects
	Endothelial permeability
	Disturbance of fluid balance
	Edema of soft tissues
	Serous effusions
	Increased flow of lymph
	Hemoconcentration
	Capillovenous congestion
	Stasis
	Petechial hemorrhages

Permeability of capillary endothelium lowers both the actual and the effective blood volume. Leakage of plasma into the tissue spaces reduces the *actual* blood volume and causes hemoconcentration, while sequestration of blood by stasis in dilated capillaries and venules reduces the *effective* blood volume. This combination leads to a disparity between the volume of blood and the volume-capacity of the vascular bed. Such a disparity produces a circulatory deficiency superficially resembling that resulting from hemorrhages. Physiological reactions compensate for minor degrees of such a deficiency. Activity of the sympathoadrenal system causes arterial constriction, stimulates cardiac function, and causes the spleen

to contract and discharge its reserve of blood into the circulation. Selective distribution of blood favors the vital organs at the expense of nonvital parts. Peripheral circulation is reduced, and the external parts become pale, cold, and almost pulseless.

So long as this compensation is effective, there is no marked decline in the arterial blood pressure but the latter is maintained at the expense of the volume flow. Stagnation of the circulation in the dilated capillaries reduces the amount of venous blood returned to the heart. This lessens the cardiac output and decreases further the volume flow. A reduced delivery of oxygen to the tissues follows, with accompanying anoxia which in itself causes further relaxation and permeability of the capillary endothelium (Krogh, 19; Landis, 20). This feature introduces a self-perpetuating factor into the mechanism, which causes it to progress as a vicious circle (see Fig. 1). When finally the compensatory reactions are no longer adequate, the blood pressure declines progressively and the complete syndrome of shock is manifested clinically. The items which constitute that syndrome were tabulated in the comparison between shock and the effects of hemorrhages.

This interpretation is confirmed by the visible circulatory changes which accompany shock. This pattern of visceral changes has been questioned on the basis of similar changes reported as seen in the viscera of animals after death from hemorrhages under barbiturate anesthesia (Blalock, 4, 5; Wiggers, 46). These authors did not provide controls on the factor of anesthesia. They overlooked the fact that prolonged barbiturate narcosis will cause a decline in blood pressure accompanied by hyperemia, ecchymoses, and edema in mucous and serous surfaces (25). Price and associates (33) found no hyperemia, ecchymoses, nor edema in the viscera of dogs after death from hemorrhage, uncomplicated by anesthesia. This finding has been confirmed repeatedly.

Before dismissing as "convenient assumptions" the visceral changes seen in shock, one should repeat the experiments and postmortem observations recorded by Richet (35), Gay and Southard (16), Manwaring (21), and Karsner (17) on anaphylaxis; Dale and Laidlaw (11), also Rich (34) on shock by histamine; Schjerning (36), Bardeen (1, 2), Wilms (47), Pack (31), Christophe (8) and others on burns; Simonds (37, 38), Underhill and Ringer (42) on the effects of peptone and other products of protein cleavage; Stone, Whipple, Bernheim, and their associates (44) on intestinal obstruction and related factors; Turck (41) on the effects of extracts of tissues; Erlanger and associates (12) on several forms of shock; Bayliss (3), Cornioley and Kotzareff (10), Coonse and associates (9) on shock by trauma; and Mason and associates (22, 23, 24) on shock by autolysis of liver in vitro. These authors, and others not cited, recorded the presence of hyperemia, capillary dilatation, ecchymoses, and edema of the soft tissues as prominent visible changes under the conditions mentioned. In most instances the visceral appearances were described objectively without comment on their significance, but it is not probable that those appearances were imaginary or assumed.

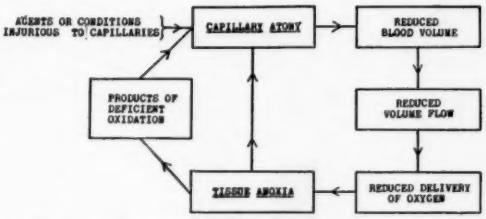


Fig. 1. The vicious circle of shock. For explanation see the text. (*Shock and Related Capillary Phenomena;* Courtesy of The Oxford Press.)

THREE IMPORTANT FEATURES

Fluid imbalance. Three major physiological disturbances accompanying shock have received inadequate attention. First among these is a disturbance of fluid balance. Several forces are concerned with movement of fluid between the blood and the tissues in either direction. Chief among these are capillary blood pressure and the osmotic attraction of the plasma colloids. The operation of these forces requires the presence of a semipermeable membrane—the endothelium. Immediately as the endothelium becomes permeable to colloids, the force known as osmosis ceases to act and the vital mechanism of fluid balance can no longer function. Endothelium so permeable that it allows plasma to escape freely is incapable of maintaining physiological relationships between the intra- and extravascular fluids.

This derangement affects other physiological processes. Absorption of fluid both from the tissues and from the gastrointestinal tract is impaired. Fluids given by mouth are not absorbed but soon are vomited; if given parenterally the fluid remains in the tissues where it has been injected. The plasma lost by leakage through permeable capillary walls is not resorbed; the mechanism which controls the volume and concentration of the blood is deranged; hemoconcentration and tissue edema follow. Numerous writ-

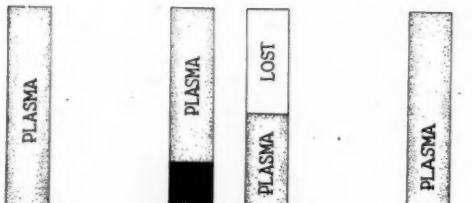


Fig. 2. Hemoconcentration and hemodilution. A volumetric comparison of normal blood with that present in shock and that resulting from hemorrhage. If normal blood (first column) becomes concentrated 40 per cent, it will have the composition shown in the second column. Seven cubic centimeters of such concentrated blood will contain the same volume of corpuscles (third column) as 10 cc. of normal blood, 3 cc. having been lost. In shock with hemoconcentration of 40 per cent, the normal blood has lost 30 per cent of its total volume and 50 per cent of its plasma volume.

The fourth column illustrates the hemodilution which occurs when the corpuscles have been reduced by hemorrhages to 40 per cent of the normal. (Courtesy of The Oxford Press.)

ers since the time of Heidenhain and of Starling have noted these features and have confirmed the fact that injury to endothelium causes a marked increase in the flow of lymph accompanied by hemoconcentration.

One function of fluid balance maintains the volume and composition of the blood at normal levels. When fluid balance is deranged, as by abnormal permeability of capillary endothelium, fluid leaks out into the tissue spaces. This reduces the volume of the blood and increases the numerical count of the erythrocytes—a condition known as hemoconcentration (Fig. 2).

It has been shown (30) that hemoconcentration is the earliest detectable sign of secondary shock and a valuable index of its degree or severity. Many authors now advise observations on the concentration of the blood as a guide to the use of plasma or of transfusions in treatment.

Imbalance of electrolytes. A derangement of electrolytic balance likewise accompanies shock. Physiologists and cytologists have supplied information on the mechanism by which this occurs. It has been shown that the outer surface of normal cells functions as a semipermeable membrane and that some vital property of living protoplasm maintains chemical concentration *within* the cell, which differs markedly from that of the *external fluid* (Gamble, 15). This property is decreased by lack of oxygen or by any kind of damage to the cell; the property is lost entirely as the cell dies.

For example, the cellular and extracellular fluids differ markedly in their content of potassium and of sodium. The approximate degree of this is shown in the following ratios:

K (cellular): K (extracellular) = 21:1

Na (cellular): Na (extracellular) = 1:30

The effects of anoxia or of deleterious agents render the protoplasm incapable of maintaining these differences in ionic concentrations. Immediately there is a movement of ions from the region of the higher to that of the lower concentration, which tends to equalize them. Obviously this will increase markedly the potassium content of the plasma and decrease its content of sodium. The concentration of other ions, both acid and basic, is affected in a similar fashion.

Chemical changes of this kind have been demonstrated in the blood plasma during shock from various causes. The same injurious agents which disturb fluid balance by affecting the endothelium may also disturb chemical concentrations by increasing the cellular permeability. The former effect results in shock accompanied by hemoconcentration; the latter effect provides a satisfying explanation for the accompanying chemical alterations in the blood and tissue fluids.

Now and again doctors are advised to maintain fluid balance and to correct disturbances of chemical composition in the blood and body fluids of patients who are gravely ill. One questions whether this advice arises from an accurate understanding of how such disturbances develop. The proposed methods for re-establishing fluid balance and for correcting the chemical disorders certainly do not affect the mechanisms involved. To inject saline fluids, in the hope of correcting the disordered function, is like turning fire extinguishers upon the smoke rather than upon the hidden flames.

Renal dysfunction. A grave defect in the renal function is the third item of importance. In shock from diverse causes, this is evidenced by oliguria or anuria, by a progressive accumulation of nitrogenous wastes in the blood, and by casts, debris, albumin, and other abnormal findings in the urine. When shock develops, the physician's chief concern is to remove the cause and to avert death by circulatory failure. Evidence of renal dysfunction is not so obvious and receives relatively little attention. However, renal deficiency becomes prominent when patients survive for

several days in a state of sublethal shock. It frequently happens in such cases that defective renal function comes to dominate the clinical picture: excretion is inadequate, the nonprotein nitrogen rises progressively, hyperazotemia develops, and the clinical syndrome of uremia precedes death. This is exemplified in crush injuries, in nonfatal shock from trauma or from burns, intestinal obstruction, metabolic intoxication as in diabetes, icterus gravis, toxemia complicating pregnancy, anaphylactic reactions, transfusions with incompatible blood, poisoning with various drugs, and in severe infections.

Striking examples of sublethal shock leading to azotemia are those of crush injuries reported in the British literature. Victims of air raids have been pinioned under masonry and debris for hours. Some of these had no broken bones nor open wounds, but suffered the effects of prolonged pressure upon the limbs. When rescued they developed signs of shock, which were counteracted by modern treatment. Despite the fact that adequate systemic circulation was maintained, these patients developed the complete syndrome of uremia and died from progressive renal insufficiency.

At autopsy such patients showed the pattern of congestive, edematous, visceral changes which are characteristic of shock. The traumatized muscles were pale, friable, and necrotic. The kidneys were pale, swollen, streaked with red, and showed marked brownish pigmentation. The urine was loaded with the same pigment. Later this was shown to be myoglobin, not hemoglobin; its source as derived from damaged muscle is prima-facie evidence of absorption from areas which have been traumatized.

The kidneys in such cases show regularly the following changes. They are moderately swollen and pale, sometimes hyperemic. Red flecks and streaks are seen in the cortex and medulla, respectively. Microscopically, both the proximal and distal convoluted tubules show severe injury ranging from parenchymatous degeneration to complete necrosis and dissolution of the epithelial lining. The lumina are moderately dilated; they contain granular debris, red cells, and sometimes casts. Areas of capillary hemorrhage are found in both cortex and medulla. There are granules and clumps of brown pigment, seen particularly in the collecting tubules. The interstitial tissue is moderately edematous; in some instances slight localized lymphocytic infiltration is present. The glomeruli are moderately hyperemic and the capsular space contains albuminous granules, and sometimes erythrocytes.

The renal findings are similar after death from shock and in sublethal shock with death from uremia. When recovery occurs, the renal function returns to normal. This condition is independent of pre-existing renal disease and does not lead to true nephritis. (For a more complete discussion, see Reference 26.)

This type of renal disorder was known to Osler and his contemporaries as "acute parenchymatous nephritis." They recognized its occurrence under several of the conditions previously mentioned. Modern writers discuss the same syndrome as "extrarenal uremia." Pathologists have no appropriate designation for the renal damage; many speak of it, rather vaguely, as nephrosis.

The exact nature and pathogenesis of renal failure, accompanied by parenchymatous degeneration and necrosis in otherwise normal kidneys, as a complication of sublethal shock, is a subject for future investigations. There is suggestive evidence that the same injurious agents, including toxins and anoxia, which cause circulatory failure by their effects upon the endothelium, likewise cause renal failure by their effects upon the parenchyma of the kidneys. If so, then this condition is analogous to that resulting from the effects of other poisons which cause degeneration and necrosis of renal tubular epithelium.

Definition. The major functional derangements present regularly in secondary shock may be used in a definition to distinguish it from other conditions. Such a definition might read as follows:

Shock is a disturbance of fluid balance resulting in a peripheral circulatory deficiency which is manifested by a decreased volume of blood, reduced volume flow, hemoconcentration, and renal functional deficiency.

CLINICAL IMPLICATIONS

The clinical management of shock depends primarily on a comprehension of the various conditions under which it may develop and on the prevention of these when possible. *The best treatment for shock is prevention.* Of prime importance is the recognition of the various conditions in which shock may develop. Hence, not only after trauma, extensive surgery, or burns, but also in severe infections, intoxications, and in abdominal emergencies such as thrombosis, strangulation, perforation, and the like, the anticipation of shock may make its prevention possible.

Early amputation of mangled limbs, débridement of lacerated wounds, prompt local treatment of burns by coagulation, surgical relief of an infarcted or strangulated loop of bowel, and the drainage of infected areas are procedures which

may forestall the development of shock. Likewise, the prevention of infection, by therapeutic or other means, removes a potent contributory factor.

The careful surgeon reduces the danger of shock by reducing to the minimum both the depth and the duration of anesthesia and by using regional or local anesthesia when possible. General anesthesia usually will not of itself cause shock, but it often leaves only a narrow margin of safety when combined with other shock-producing conditions.

The successful management of shock requires primarily that the conditions which cause it shall be obviated or removed; otherwise, efforts to restore the failing circulation are predestined to failure. For example, unlimited quantities of plasma probably would not prevent death from intestinal strangulation or from a crushed and mangled limb unless the causative condition could be obviated effectively.

In the treatment of shock, the first essential is an accurate differential diagnosis between three conditions which commonly result from wounds and which present similar clinical features. These are: (1) primary or initial shock, (2) the effects of hemorrhages, and (3) true shock, otherwise known as secondary or delayed shock.

Hemoconcentration is most valuable for differentiation. It may be shown either by counts of the red blood cells, by hemoglobin readings, by hematocrit, or by the specific gravity of the whole blood. If means are lacking for making these determinations, then hemoglobin estimation by means of the simple Talquist scale may serve the purpose adequately. Whatever method is used, a reading should be made when the injured patient is first seen. Subsequent readings at intervals of one or two hours will indicate both the degree and the progress of the condition when either secondary shock or hemorrhage is affecting the circulation.

Primary or initial shock is essentially similar to fainting or syncope. It is due to a vasomotor reaction which may be excited by pain, fright, grief, or the sight of blood or of a mangled wound. The victim often manifests the clinical signs of true shock, including weakness, pallor, perspiration, a feeble rapid pulse, and low arterial pressure. This condition develops immediately after the injury and is usually transient, while true shock develops slowly but tends to progress. Primary shock usually requires no treatment other than quiet and rest in a horizontal position. In cases of severe abdominal or cranial injuries, primary shock may merge over into true or delayed shock without an interval of partial recovery. Primary shock is not associated with capillary atony or endothelial permeability; hence, it does not produce concentration of the blood. The lapse of time between the injury and the circulatory disturbance and the presence or absence of hemoconcentration are valuable points of distinction between primary and secondary shock.

Severe hemorrhages will cause clinical signs like those of secondary shock. They may be differentiated by the fact that *hemodilution occurs immediately* after hemorrhages, and the degree of dilution is proportional to the amount of blood lost. If the hemoglobin and red blood cells are not reduced below 50 per cent, an otherwise healthy person will recover spontaneously. Fluids given by mouth or intravenously, or transfusions of blood or of plasma will hasten recovery. If the hemoglobin is much below 50 per cent, a transfusion of blood should be given. It should be remembered that hemoglobin below 30 per cent indicates a critical condition.

True or secondary shock requires several hours for development. It is seldom seen within four hours except following abdominal or cranial injuries; for this reason it is often called delayed shock. A marked and progressive decline in the blood pressure is emphasized by most writers as the characteristic sign of shock. This is true in the same sense that widespread metastases are a sign of carcinoma. Many surgeons and experimenters have observed and emphasized that in the early stages of shock there is a rise in the arterial blood pressure following injuries or burns. Blalock (5) states that the blood pressure is an inadequate guide to the state of the circulation in incipient shock. So long as the mechanism of compensation is effective, there is no serious decline in arterial pressure; when the latter develops it indicates that the mechanism of compensation is failing and that the condition is becoming critical. An ominous fall in the blood pressure is not a sign of incipient shock; often it is a sign of departed opportunity!

The incipient stage of shock may be detected by the presence of moderate hemoconcentration, 10 to 20 per cent, even before any evidence of circulatory deficiency is manifested clinically. This finding will serve to distinguish it from either primary shock or from the effects of hemorrhage.

Several therapeutic misconceptions are prevalent concerning shock. There is no basis for the belief that morphine is useful in counteraction or prevention. On the contrary, morphine is dangerous when given in full doses because it inhibits respiration and thereby increases anoxia which is a major factor in this condition. Sufficient morphine should be given to allay pain and appre-

hension, but amounts sufficient to lower the respiratory rate will accelerate the development of shock.

Repeated experiences have shown that stimulants, such as digitalis, strychnine, and adrenaline, are not only useless; they may be distinctly harmful. Cardiac deficiency is not a factor in the development of shock; the vasomotor system is active and the peripheral arteries are already contracted to the maximum. Under such conditions adrenaline cannot be expected to benefit the patient, and it should be remembered that, in large or repeated doses, it will actually cause shock in experimental animals.

Another matter deserving thoughtful consideration is the application of heat in attempts to prevent or to counteract shock. It is natural that physicians should note the low peripheral circulation and temperature and should try to relieve them artificially. The application of heat is widely practiced, perhaps without due consideration of the physiological principles involved. During shock and after hemorrhage the blood volume is reduced. There is insufficient blood to fill the entire vascular bed and to support metabolism throughout the body. Physiological reactions compensate for this condition by a *selective* redistribution of blood, favoring vital organs at the expense of the external parts. The vascular channels in nonvital areas become collapsed and bloodless, but both the circulation and metabolism are maintained where they are most needed.

It is possible to open up the peripheral vascular bed by the application of heat and stimulants. However, this counteracts nature's mechanism for conservation; the blood required to fill this vascular area, lowers needlessly the already depleted reserve of blood. Recent evidence, both experimental and clinical, indicates that the use of heat in the treatment of shock causes further circulatory deficiency and that the results are detrimental.

Those remedies which have proved useful are agents which tend to counteract one or another of the major items by which shock develops or progresses. Chief among these items are anoxia, endothelial permeability and reduced blood volume. Lack of oxygen accelerates the development and progress of shock. The inhalation of oxygen aids in counteracting this and in preventing irreparable damage. It raises metabolic activity and tends to interrupt the action of the vicious circle even after shock has been initiated.

One function of the adrenocortical hormone is to maintain the normal impermeability of the endothelium. There is significant evidence, both experimental and clinical, that this substance is distinctly beneficial in the prevention and in the treatment of shock.

The successful management of shock requires, first, that the condition which caused it shall be removed; next, that the fluid which was lost from the blood be replaced by fluid which should approximate closely the composition of that lost; thus after serious hemorrhages, transfusions of whole blood provide the ideal remedy. However, in shock accompanied by hemoconcentration, whole blood is not so suitable; it does not relieve the hemoconcentration which, because of viscosity, tends to impede the circulation through the capillaries. The patient does not lack erythrocytes but he sorely needs fluid to restore the blood to its normal composition and volume. These considerations indicate clearly that the ideal replacement fluid is either human plasma or serum.

These substances are now available in most hospitals and medical centers, either in the original form or dehydrated. Plasma or serum, given in the normal or isotonic concentration, serves admirably as a replacement fluid to restore blood volume and to reduce hemoconcentration. But the same amount of plasma, concentrated to one-half or even to one-fifth of its original volume, is far more effective in counteracting both the low blood volume and the deranged equilibrium of fluids which are prominent factors in the mechanism by which shock develops.

Concentrated plasma or serum given intravenously, raises the colloidal osmotic pressure of the blood and thereby draws fluid from the tissues into the vascular system. This accomplishes several desirable results; it increases directly the total blood volume; it relieves the hemoconcentration, reduces the viscosity of the blood and restores fluid balance; it tends to reduce the edema of soft tissues; it also relieves the hypoproteinemia which often is a notable feature. These effects increase the circulatory efficiency and the delivery of oxygen to the tissues. The relief of anoxia removes a most important factor from the viscious circle by which the deficiency progresses.

The clinical use of plasma or serum has established beyond question the effectiveness of this treatment for shock following surgical procedures, accidental injuries, burns, air-raid casualties, and battle wounds. Recent figures released from the Surgeon General's office, indicate that the mortality among wounded soldiers is 2.7 per cent. In other words, of every 1,000 men wounded, only 27 die. An even lower mortality is reported from wounds and burns among the naval forces. These remarkable results are attributed, first, to the

prompt use of plasma; second, to early and proper surgical treatment of the wounds; and, third, to the use of sulpha drugs.

Let it be emphasized that *early* recognition and treatment are of the highest importance if favorable results are hoped for. Treatment, to be effective, must anticipate the complicated interplay of the agencies which culminates in the syndrome of shock. It must be administered before the failing circulation and the associated anoxia have produced irreversible changes in tissues with vital functions.

BIBLIOGRAPHY

1. Bardeen, C. R. Bull. Johns Hopkins Hosp., 1896–97, 7: 81.
2. Idem. J. Exp. M., 1897, 2: 501.
3. Bayliss, W. M. Spec. Rept. Series No. 26, London, H. M. S. Office, 1918, p. 23.
4. Blalock, A. Surg. Gyn. Obst., 1934, 58: 551.
4a. Idem. Problems on Shock. Surg., 1943, 14: 487.
5. Idem. Principles of Surgical Care, Shock, and Other Problems. St. Louis: C. V. Mosby Co., 1940.
6. Best, C. H., and Solandt, D. Y. Canad. M. Ass. J., 1940, 43: 208.
7. Cannon, W. B. Med. Dept. U. S. Army in the World War. Washington, Surgeon General's Office, 1923, 11: 186.
8. Christophe, L. La Mort des Brûlés. Paris: Masson et Cie, 1939.
9. Coonse, G. K., Foise, P. S., Robertson, H. F., and Aufranc, O. S. N. England J. M., 1935, 212: 647.
10. Cornioley and Kotzareff. Rev. chir., Par., 1921, 59: 1, 239.
11. Dale, H. H., and Laidlaw, P. P. J. Physiol., Lond., 1918–19, 52: 355.
12. Erlanger, J., Gessell, R., Gasser, H. S., and Elliott, B. L. J. Am. M. Ass., 1917, 69: 2089.
13. Evans, I. E., Hoover, M. J., James, G. W., III, and Alm, T. Ann. Surg., 1944, 119: 64.
14. Freeman, N. E., Cullen, M. L., and Schecter, A. E. Bulletin of Subcommittee on Shock, Natnl. Res. Council, 1941, p. 88. Also Personal Letter to Author.
15. Gamble, J. L. Bull. Johns Hopkins Hosp., 1937, 61: 151.
16. Gay, F. P., and Southard, E. E. J. Med. Res., 1907, 16: 143.
17. Karsner, H. T. Zschr. Immunforsch., 1912, 14: 81.
18. Kendrick, D. B., Jr., Essex, H. E., and Helmholz, H. F., Jr. Surgery, 1940, 7: 753.
19. Krogh, A. Anatomy and Physiology of the Capillaries; Ed. 2. New Haven: Yale University Press, 1929.
20. Landis, E. M. Physiol. Rev., 1934, 14: 404.
21. Manwaring, W. H., Chilcote, R. C., and Hosepian, V. M. J. Am. M. Ass., 1923, 80: 303.
22. Mason, E. C., and Lemon, C. W. Surg. Gyn. Obst., 1931, 53: 60.
23. Ibid., 1932, 55: 427.
24. Mason, E. C., and Nau, C. A. Surg. Gyn. Obst., 1935, 60: 769.
25. Moon, V. H. Shock and Related Capillary Phenomena. New York: Oxford University Press, 1938.
26. Idem. Shock, Its Dynamics, Occurrence, and Management. Philadelphia: Lea & Febiger, 1942.
27. Idem. Am. J. M. Sc., 1942, 203: 1.
28. Moon, V. H., Morgan, D. R., Leiber, M. M., and McGrew, D. Arch. Path., Chicago, 1937, 24: 642, 794.
29. Idem. J. Am. M. Ass., 1941, 117: 2024.
30. Idem. Am. J. Clin. Path., 1941, 11: 361.
31. Pack, G. T. Arch. Path., Chic., 1926, 1: 767.
32. Phemister, D. B., Laester, C. H., Eichelberger, L., and Schachter, R. J. Ann. Surg., 1944, 119: 26.
33. Price, P. B., Hanlon, C. R., Longmire, W. P., and Metcalf, W. Bull. Johns Hopkins Hosp., 1941, 69: 327.
34. Rich, A. R. J. Exp. M., 1921, 33: 287.
35. Richet, C. C. rend. Soc. biol., 1902, 54: 837.
36. Schjerning, O. Vjschr. gerichtl. Med., 1884, 41: 24, 273.
37. Simonds, J. P. J. Am. M. Ass., 1917, 69: 883.
38. Idem. Am. J. Physiol., 1925, 42: 1.
39. Stone, H. B., Bernheim, B. M., and Whipple, G. H. Bull. Johns Hopkins Hosp., 1912, 23: 159.
40. Idem. Ann. Surg., 1914, 59: 712. (See also Ref. 44.)
41. Turck, F. B. J. Am. M. Ass., 1897, 28: 1160.
42. Underhill, F. P., and Ringer, M. J. Pharm. Exp. Ther., 1922, 19: 135.
43. Whipple, G. H., Smith, H. P., and Belt, A. E. Am. J. Physiol., 1920, 52: 72.
44. Whipple, G. H., Stone, H. B., and Bernheim, B. M. J. Exp. M., 1913, 17: 286, 323.
45. Whipple, G. H., and Van Slyke, D. D. J. Exp. M., 1918, 28: 213.
46. Wiggers, C. J. Exp. M. & S., 1943, 1: 2.
47. Wilms, M. Mitt. Grenzgeb. Med. Chir., 1901, 8: 292.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Kelemen, G.: Collateral Infection of the Temporal Bone in Fulminating Osteomyelitis of the Frontal Bone. *Laryngoscope*, 1944, 54: 76.

A fourteen-year-old boy developed a diffuse spreading osteomyelitis of the bones of the skull as a complication of sinusitis following swimming. A large subdural abscess over the right frontal lobe was drained. Blood cultures showed the anaerobic staphylococcus albus and the aerobic staphylococcus aureus.

Death occurred from diffuse meningitis twenty-three days after the onset of infection.

Histopathological examination showed that the marrow spaces of the temporal bones had escaped involvement, whereas the pneumatic spaces presented a diffuse inflammatory reaction classed as a subacute exudative otitis media on both sides.

Commenting on the infrequent involvement of the temporal bone by diffuse osteomyelitis of the skull, the author interprets the inflammatory changes in the pneumatic-cell system as a protection of the marrow spaces of the temporal bone from invasion.

Propagation of an osteomyelitis is mainly by way of the blood stream. The petrosquamosal suture, like other suture lines in the skull, presents little barrier and the inflammatory process extends across it to the pneumatic cell system. The process there becomes a pneumato-otitic one instead of osteomyelitic. The reactive inflammation and fibrosis in the linings of the pneumatic cells tends to limit extension of the osteomyelitis. The intimate connection between mucosa of the cell system and the marrow spaces disappears at an early age and an inflammatory process in the cell system seldom invades the marrow thereafter. Therefore, although an osteomyelitis may set up an exudative inflammatory reaction in the adjoining pneumatic spaces, the latter provides a barrier to further extension of the osteomyelitis. The usual isolation of the temporal bone from a generalized osteomyelitis of the skull bones is due to the interposed pneumatic cell system.

JOHN R. LINDSAY, M.D.

Marquand, H. S. Le, and Recordon, E. G.: Aseptic Cavernous-Sinus Thrombosis, with Recovery. *Lancet*, Lond., 1944, 246: 247.

Following a blow over the right eye by a soccer ball, a twenty-nine-year-old male suffered a "commotio retinae" for which he was hospitalized. One week after the blow he suffered a sore throat with a temperature of 101.8° F., and the hemolytic streptococcus was found on culture. This condition subsided after therapy with 8 gm. of sulfapyridine.

Two weeks after the injury, a frontal headache occurred and increased for two days and was then followed by signs of a bilateral cavernous-sinus thrombosis. Both eyes were proptosed, the lids edematous, the conjunctivae chemosed and congested, and movement was restricted in all directions. There was intense headache but no changes in the fundi and no abnormal neurological signs. The temperature never exceeded 99.4° F. The patient was treated with sulfapyridine (10 gm.) and sulfathiazole (15 gm.) with full recovery within five days except for slight residual retinal disturbance in the right eye.

The thrombosis was considered to be an aseptic process, following the injury. The sulfonamide therapy was probably unimportant.

JOHN R. LINDSAY, M.D.

Kazanjian, V. H.: Early Treatment of Gunshot Wounds of the Face and Jaws. *Surgery*, 1944, 15: 22.

Treatment of gunshot wounds of the face and jaws is divided into two distinct periods: (1) the early period which is the most critical stage of the patient's life and extends over the first three or four weeks following injury, and (2) the later period which is confined chiefly to further repair of the deformity.

This article is concerned with treatment of the first period only; and can be summarized as follows:

1. The treatment of maxillofacial patients can be more extensively carried out when such patients are segregated in an especially designated center where facilities are adequate.

2. All gunshot wounds are considered infected wounds and treated as such.

3. Primary suture of face wounds immediately after injury is found to be contraindicated in gunshot wounds of the face, but late primary suture within about two weeks has been found practicable.

4. Immobilization of fragments should receive especial attention before late primary suturing is done.

Complications in the early period of treatment are discussed and special emphasis is given to secondary hemorrhage, the cause of most of the fatalities.

J. M. MORA, M.D.

Trueblood, D. V.: Clinical Observations and Surgical Experiences with Parotid Tumors. *West. J. Surg.*, 1944, 52: 109.

The author believes that all mixed tumors of the parotid gland are potentially malignant and should be subjected to radical surgery. By radical surgery is meant complete extirpation of the parotid gland with preservation of the facial nerve. Sudden rapid

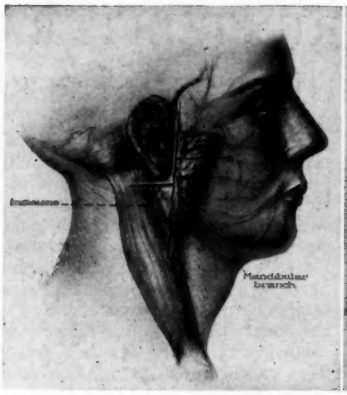


Fig. 1. Skin incisions.

Fig. 2. Exposure of parotid gland.

growth and disfigurement of the face are indications for radical surgery. Simple enucleation of the lump is not satisfactory because it permits recurrence. A lump appearing in the parotid region which does not grow can be safely observed without surgical interference. Frozen section at the time of operation to classify a mixed tumor does not offer any advantage since the tumor cannot be characterized as benign or malignant and the section does not offer any prognostic signs. In every case of mixed tumor the entire parotid gland should be removed, but that does not imply that the facial nerve must be sacrificed deliberately even if malignancy is present.

The author offers photographic and photomicrographic evidence of 2 of a series of 16 patients subjected to extirpation of the parotid gland. In the entire series none of the patients has as yet shown evidence of facial palsy or recurrence of the tumor.

The operative procedure requires at least two incisions; the first, a vertical one, begins at the hair line in front of the ear and extends down into the neck. The second incision is placed under the ear and extends posteriorly in a horizontal direction. If necessary for better exposure of the gland, a third horizontal incision may be made above the second incision but extending anteriorly. The incised skin is then dissected back. The tendon of the sternomastoid attachment to the mastoid process is identified and the base of the facial nerve is exposed by dissection from its deep location. The nerve is identified by light pinching and the facial twitching which ensues. The branches of the facial nerve are

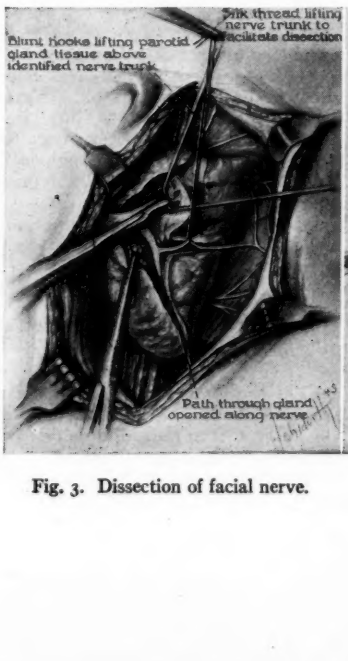

Silk thread lifting nerve trunk to facilitate dissection
Blunt hooks lifting parotid gland tissue above identified nerve trunk
Path through gland opened along nerve

Fig. 3. Dissection of facial nerve.

Fig. 4. Removal of parotid gland.

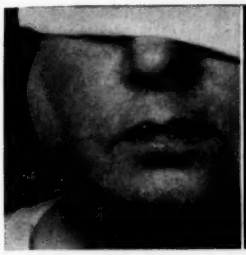


Fig. 5.

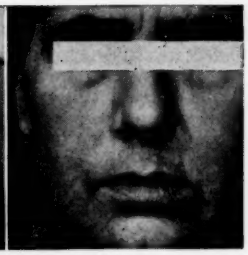


Fig. 6.

Fig. 5. A kernel appeared in the right side of the face fifteen years before the patient came to the clinic in January, 1936. Surgical removal was done in January 1936. Diagnosis: mixed tumor of the parotid gland. A slight facial paralysis occurred but it disappeared later. The condition was satisfactory with no paralysis in August, 1943.

Fig. 6. Same patient as in Figure 5. Condition satisfactory; no paralysis in August, 1943.

traced to the distant margin of the gland. In the dissection of the nerve branches, care must be exercised so as not to include them in the hemostats which control the bleeding from the small accompanying vessels. The gland tissue is removed between the isolated nerve branches. A small pack of gauze is placed in the cavity to emerge posteriorly from the incision over the mastoid. The skin is then closed. The time required for this operation is between four and five hours. Postoperatively, a facial palsy exists for a period up to ten weeks; it is due to surgical manipulation of the nerves.

B. G. P. Shafiroff, M.D.

EYE

Cordes, F. C.: Fever Therapy in Ophthalmology. *J. Am. M. Ass.*, 1944, 124: 14.

The use of artificial-fever therapy in ocular disease is usually confined to the parenteral injection of nonspecific protein, the use of malaria, and physical means. It is probably more effective in inflammations of the uveal tract than in lesions of any other part of the body, although it has been utilized in a wide variety of ocular diseases.

Foreign-protein therapy is not without risk and there are definite contraindications to its use. Many substances have been employed, of which typhoid vaccine is the most popular. The author modified his dosage after the death of 2 young and apparently healthy individuals in San Francisco in 1935 (following the use of typhoid vaccine for ocular disease), and he now starts with a dose of between 5 and 7 million killed organisms. The dose is increased to from 7½ to 9 million on the following day, from 9 to 10 million on the third day, and from 12 to 15 million on the fourth day. This has given a satisfactory rise in temperature (from 101.4° to 102.1° F.) and the advantage of a more sustained effect than a larger dose with a longer interval between. In infants intramuscular milk injections may be substituted for the intravenous typhoid.

Coley's mixed toxins may be used when the patient's condition does not warrant the use of typhoid. Omnadin is less effective than typhoid but may be used when the latter is contraindicated.

The use of malaria is not justified for ophthalmic disease.

Hyperpyrexia by high-frequency methods is still in an experimental stage. Production of fever by physical means is most effective in syphilitic diseases of the eye. Air-conditioned cabinets of the Kettering hypotherm type would seem to be the best, but they should be used only when other forms of therapy are unsatisfactory. William A. Mann, Jr., M.D.

MOUTH

Moore, M., and Jorstad, L. H.: Histoplasmosis and Its Importance to Otorhinolaryngologists. A Review with Report of a New Case. *Ann. Otol. Rhinol.*, 1943, 52: 779.

Histoplasmosis, Darling's disease, reticuloendothelial cytomycosis, or histiocytosis is a fungous infection caused by organisms of the genus histoplasma (capsulatum, pyriforme). The disease is characterized usually by fever, loss of weight or emaciation, anemia, leucopenia, and splenohepatomegaly, with marked invasion by reticuloendothelial histiocytes containing organisms. The disease may be acute or chronic, lasting from a few weeks to many years, but it is invariably fatal.

From the standpoint of otorhinolaryngologists, histoplasmosis should be an important clinical entity because of its various complications and its ability to simulate known diseases such as carcinoma, otitis media, rhinoscleroma, laryngeal tuberculosis, aleucemic leucemia, lymphoma, noma, leishmaniasis, and others.

The organism responsible for reticuloendothelial cytomycosis, or histoplasmosis, as first described in tissue by Darling, was named histoplasma capsulatum because it appeared very much like a protozoon. Da Rocha-Lima studied the organism as it appeared in tissue sections and found that it multiplied by elongation and fission (budding), and this led him to believe that the microbe was closely related to, if not identical with, the cryptococcus farciminosus, the cause of epizootic lymphangitis in horses.

The organism is seen in tissue, usually in reticuloendothelial phagocytes, monocytes, alveolar cells, epithelial cells as of the buccal mucosa or intestinal mucosa, bone marrow, and peripheral blood, or freely distributed in affected tissue.

It is easily grown on routine fungous, artificial mediums. It may also be cultivated on 2 per cent dextrose agar, as well as on mediums containing 10 per cent rabbit or human blood. The organism is an aerobe, but it may grow in partial anaerobiasis.

The portal of entry has been largely a matter of conjecture, especially since it is difficult to establish the seat of the infection. In some cases, the lesions

have been confined almost wholly to the lungs. This suggests the respiratory tract as the route of infection. Many of the lesions of the oral cavity appear to be primary and this speaks in favor of the inhalation method. Also, gastrointestinal lesions serve only to emphasize the oral cavity as the portal of entry. Since fungi have been found in the discharge from patients with otitis media, usually infants, it has been suggested that the ear may also serve as a portal of entry.

As far as can be determined, histoplasmosis respects neither sex, color, age, nor nationality. Rich and poor alike may be affected. No one seems to be immune. A review of the known cases shows that both males and females may be infected with histoplasma, the number of males being greater. White, negro, mulatto, and Chinese have suffered with the disease. The age of the patients has varied, approximately one-fourth of the published cases occurring in infants and the youngest being three months of age.

Of chief importance, histologically, is the location and distribution of the fungi. These are present usually in large numbers, within large mononuclear cells of the reticuloendothelial system. In general, the organisms may be found widely distributed in the organs containing necrotic lesions or reticuloendothelial cells.

Histoplasmosis is characterized by a number of clinical signs and symptoms which depend on the organ or organs involved. Lesions may be localized to one anatomic region or they may be generalized to involve practically the entire system. Usually, however, the patient dies as a result of a generalized infection. The chief signs in such cases are: anorexia, with resultant emaciation which may be severe or moderate; asthenia; anemia, occurring usually in the terminal stage; leucopenia, which may be marked; irregular pyrexia; splenomegaly; and, in many cases, hepatomegaly.

Infection of the middle ear has occurred in several cases. All the symptoms of otitis media are present. These are pain, deafness, tinnitus, vertigo, and fever. The infection is accompanied by exudate which may be purulent, the organisms being demonstrable in smears therefrom. Histoplasmosis of the external auditory canal has been noted.

The naso-oral type may or may not be a continuation of the mucocutaneous type. In a few cases in which infection involved the lips there was likewise an infection of the naso-oral cavity. The lesions are usually found to be granulomatous in character.

The clinical diagnosis of histoplasmosis is not an easy matter. Its similarity to many diseases is well exemplified by the large number of clinical diagnoses and impressions.

Histoplasmosis is invariably a fatal disease. Extremely few patients have been reported as remaining alive. Since the disease becomes systemic in due course of time, in spite of present methods of treatment, it is quite possible that a follow-up in these cases would disclose a fatal termination.

Treatment for this infectious disease has been varied, in the main symptomatic, and partially ineffectual. The use of potassium iodide given by mouth or of sodium iodide given intravenously has not been satisfactory. Neoarsphenamine has likewise been of no value in this disease. Roentgen-ray therapy has been tried in several cases without apparent benefit. Many chemotherapeutic agents have been tried with some alleviation of the symptoms, but in general they have failed to bring about a cure. Of the antimony preparations such as antimony tartrate, fuadin (the trivalent organic compound) and neostam (the pentavalent compound) have been employed with some benefit.

Twenty-two cases of histoplasmosis with lesions of the ear, nose, or throat, separate or combined, and with or without lesions in other organs of the body are reported. These constitute approximately 30 per cent of all the cases of histoplasmosis, published and unpublished. JOHN F. DELPH, M.D.

Herrell, W. E., and Nichols, D. R.: Penicillin in the Treatment of Cellulitis of the Mouth. *Am. J. Orthodont.*, 1944, 30: 1.

Cellulitis of the floor of the mouth is considered a virulent, and often a serious, type of inflammation. If the infection is extensive, the process may terminate fatally.

There is no uniformity of opinion as to the most satisfactory method of treating cellulitis of the floor of the mouth. It is uniformly agreed, however, that for the most part extensive infection in the floor of the mouth is difficult to treat satisfactorily.

The authors have used penicillin in 6 cases of extensive cellulitis of the floor of the mouth. All of the patients were seriously ill. In 2 cases the cellulitis was complicated by the presence of septicemia. In 1 of these cases, the organism present in the blood was the staphylococcus aureus, and in the other, it was a hemolytic streptococcus. In the remaining 4 cases, the blood cultures were negative. The organism isolated in this group of cases was either a hemolytic streptococcus, or the staphylococcus aureus. Sulfonamide therapy had been tried previously and found ineffective in all but 1 case. One of the patients nearly died before sufficient penicillin could be administered to control the infection. Two others showed evidence of overwhelming toxemia. In all of the cases, the patient had marked difficulty in swallowing. In several cases, the induration extended far down into the structures of the neck.

The penicillin was administered by the continuous intravenous drip method. The patients received from 32,000 to 40,000 Oxford units of penicillin in 2 liters of physiological salt solution daily. Half of the daily dose in 1 liter of solution was attached to the intravenous apparatus morning and evening. The penicillin solution was administered at the rate of from 30 to 35 drops per minute. There was marked clinical improvement in all of the cases, and the patients were able to swallow without difficulty within from forty-eight to seventy-two hours. The tem-

perature, as a rule, subsided by lysis. The first sign of improvement was, as a rule, a decrease in the toxemia. In the 2 cases in which the cellulitis was complicated by septicemia, the blood cultures became negative within forty-eight hours. In some instances the edema of the face disappeared dramatically; however, the induration subsided more slowly.

If subsequent studies show that pencillin therapy will accomplish satisfactory results in such cases, it may be possible to avoid extensive and radical surgical procedures, which have often been necessary. It seems likely that the use of penicillin may shorten the period of convalescence and reduce the hazard of complications associated with cellulitis of the mouth.

NECK

Pressman, J. J.: Effect of the Sphincteric Action of the Larynx on Intra-Abdominal Pressure and on the Muscular Action of the Pectoral Girdle. *Arch. Otolar.*, Chic., 1944, 39: 14.

The author demonstrated by experiments the effect of the action of the laryngeal sphincter on the movements of the diaphragm. Observations on the diaphragmatic movements during comparable efforts to increase intra-abdominal pressure when the laryngeal sphincter was functioning and when it was deprived of function revealed that on effort to increase intra-abdominal pressure the concurrent upward movement of the diaphragm was, on the average, twice as great when the sphincteric closure of the larynx did not take place. Thus, with the airway patent the volume of the abdominal cavity is increased by virtue of the elevation of the diaphragm during efforts to increase intra-abdominal pressure. This increase in volume tends to lessen the elevation in intra-abdominal pressure, all other factors being equal. Experiments showed no loss of strength in the pectoral muscle girdle when the human subject was deprived of the use of the laryngeal sphincter valve.

EARL O. LATIMER, M.D.

McCall, J. W., Dupertuis, S. M., and Gardiner, F. S.: Chondroma of the Larynx. Review of the Literature and Report of 2 Cases. *Laryngoscope*, 1944, 54: 1.

Chondroma of the larynx is rare; only 82 authenticated cases are known, to which the authors have added 2 of their own.

The most frequent site is the endolaryngeal surface of the posterior surface of the cricoid cartilage; next, the thyroid, the epiglottis, and the arytenoids.

The chondroma appears as a solid immobile mass covered by normal mucous membrane.

Pathologically, it consists of somewhat atypical cartilaginous tissue which may undergo various types of degeneration.

The age range is from fifteen to eighty-one years, but the highest incidence lies between forty and sixty years. Males predominate 4 to 1.

The symptoms are hoarseness, dyspnea, cough, and occasionally dysphagia.

The subglottic situation of the tumors makes diagnosis difficult. Roentgenograms are of help. Figi stressed the prominent vessels standing out from a normal mucous membrane covering a sessile mass.

The treatment is always surgical—enucleation, if possible, laryngotomy if the growth is extensive. The operative mortality is high. Recurrences are noted occasionally, if any part of the tumor is left behind. The tumors do not metastasize.

FRED S. MODERN, M.D.

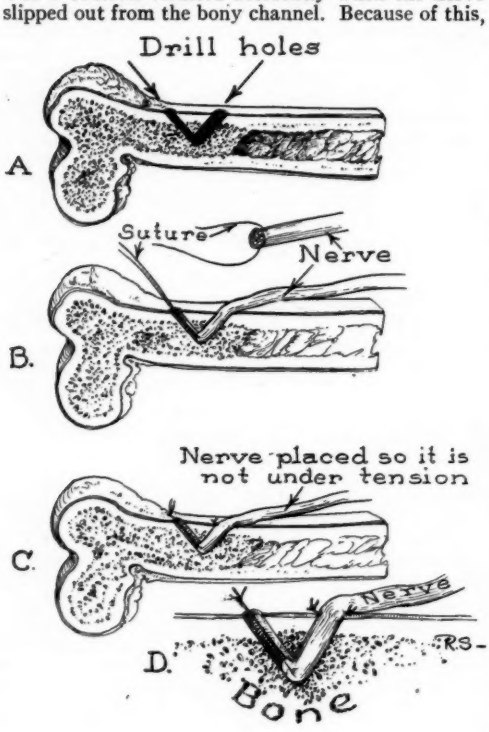
SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Boldrey, E.: Amputation Neuroma in Nerves Implanted in Bone. *Ann. Surg.*, 1943, 118: 1052.

Painful amputation neuroma has long been a serious problem, and war naturally increases the incidence tremendously. Many preventive methods have been advocated in the past, including the crushing of nerves, injection with alcohol, various classic procedures, and electrocoagulation. The numerous methods suggest the fact that none have been entirely successful.

The author has suggested a new method of handling peripheral nerves in amputated extremities. Experimental work was first undertaken with dogs. The ulnar nerve was severed and inserted into a drill-hole in the distal portion of the humerus. The dogs were sacrificed between two hundred and fifty and three hundred days later, and examinations were made. Very small neuromas had developed on the nerve that was embedded in the bone; they were approximately from ¼ to ½ the size of the neuromas which developed outside the bone in 2 controls. The 2 controls resulted accidently when the nerve slipped out from the bony channel. Because of this, a modification was employed to prevent this slipping of the nerve; it consisted of 2 drill-holes which were placed at an angle, and met in the central portion of the bone. A suture was then passed down through one opening and out the other, after it was made fast to the nerve. The distal portion of the suture was then made fast to the periosteum in order to keep the nerve embedded in the central portion of the bony canal.



This method has been employed subsequently on patients on the Orthopedic service, with good results and without the development of local pain or tenderness. However, it is too soon to evaluate the final results at the time of the writing of the article.

HOWARD BROWN, M.D.

Tarlov, I. M.: Plasma Clot Suture of Nerves—Illustrated Technique. *Surgery*, 1944, 15: 257.

The conventional method of uniting severed peripheral nerves has been with silk sutures in the nerve sheaths. Even with great care, nerve fibers are caught in the sutures, which results in incomplete regeneration. Cockerel plasma as a glue to unite the ends of nerves was suggested by Young and Medawar. Difficulties in the preparation, and inflammatory and fibrotic reactions resulting from this led to the introduction of autologous plasma clots in the suture of nerves. The method is applicable only if nerve ends can be united without tension.

Sperling has suggested a tension suture of tantalum wire placed well back of the suture line, so that the plasma clot may then be used at the site of an anastomosis. The details of a combined tantalum wire, autologous plasma clot are described largely by illustrations of the operative technique used on a dog.

A special nerve holder, including air-foam pads to protect the nerves, is employed. The nerve is cut cleanly through a special slot in the nerve holder. The nerve ends are then approximated with two tantalum-wire tension sutures extending slightly into the nerve itself, and at a distance of about ½ in. away from the suture line. Accurate approximation is thus obtained and a mold at the suture line is filled with plasma clot, which surrounds the suture line. When the clot is hardened, the mold is removed, and the tantalum wire is left, included in the clot.

A photomicrograph at thirteen days shows practically no fibrotic or inflammatory reaction at the line of suture.

Five cases are reported, one being a spinal-accessory-nerve suture with complete recovery in five and a half months. Another was an ulnar suture at the wrist; eighteen weeks after suture there was improvement in sensation, and some improvement in motor function as well. The 3 other cases have

not had enough time to permit accurate evaluation of the results.

The results of this work have been considered encouraging, and would appear to warrant further use of this method in human beings.

HOWARD BROWN, M.D.

SYMPATHETIC NERVES

Flaxman, N.: The Treatment of Hypertension: Comparison of Mortality in Medically and Surgically Treated Cases. *Ann. Int. M.*, 1944, 20: 120.

The author has compared a series of 244 hypertensive patients treated medically with a group of 350 treated surgically by Peet *et al.* In an attempt to correlate the type of patients comprising the two groups three factors were maintained: (1) only those under fifty years of age were considered; (2) renal function had to be such to keep the nonprotein nitrogen of the blood under 45 mgm. and the urine concentration above 1.012; and (3) a compensated heart was necessary in every case.

There was, however, a variance in the two groups in that the medical group consisted of 78 per cent males and the surgical group of 47 per cent males. Also there was a somewhat larger percentage of the medical group in the higher age bracket.

The total mortality rates were very similar: 30.5 per cent for those treated surgically and 31.0 per cent for those treated medically.

In another series of 76 patients, treated by Woods and Peet, in which 32 per cent were diagnosed as malignant hypertensives, 33 per cent were alive at the end of five years. The author's group revealed 13.1 per cent with malignant hypertension, of which 34 per cent were found to be alive at the end of the five-year period.

The conclusion is thus reached that it is doubtful whether specific surgery alters the course or prognosis in the condition of hypertension.

JACK I. WOOLF, M.D.

MISCELLANEOUS

Jefferson, G.: The Nature of Concussion. *Brit. M. J.*, 1944, 1: 1.

Focal lesions in the periventricular gray matter of the third ventricle, hypothalamus, and the brain stem cause stupor. These are the accepted sleep centers. Jefferson would substitute "waking centers" for "sleeping centers," as lesions in these areas cause abnormal sleep or unconsciousness.

Denny-Brown and Ritchie Russell showed that in concussion the essential factor was the suddenness of the acceleration imparted to the head and of the deceleration in different circumstances. Concussion can be produced without deformation of the skull. These experimenters have produced concussion in decerebrate animals. Concussion is due to a paralytic effect on the neurons of the brain including the brain stem. The alterations in the cerebral blood supply which either accompany or follow a concussion are secondary or epiphenomena. Contusions paralyze nervous actions even when the effects of the contusion are not either macroscopically or microscopically visible. Intact integral pathways in a vertical direction (through brain stem and hypothalamus) are of prime importance for the maintenance of consciousness. Anatomically undamaged connections in and between the hemispheres themselves are not sufficient to maintain consciousness. Although the primary effect of concussion is in the brain stem, hypothalamus, and periventricular gray matter of the third ventricle, cortical disturbances are also present. These are frequently shown by electroencephalographic changes, and by the confusion and confabulation shown by some patients after they regain consciousness.

It is not known why an initial lesion severe enough to cause neural paralysis can be survived although death occurs hours or days afterward. One explanation that suggests itself to Jefferson is that the injury sets going a self-propagating event that leads sooner or later to death.

DAVID IMPASTATO, M.D.

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Cory, R. A. S.: Death From Air Embolism Following Bronchoscopy. *J. Thorac. Surg.*, 1944, 13: 30.

Septic infections of the lung, such as abscess and bronchiectasis, not uncommonly give rise to metastatic, and presumably embolic, abscess of the brain. The question of air embolism after bronchoscopy does not, however, appear to have received much attention.

The patient, in the case reported, had had repeated bronchoscopic aspirations of the contents of a bronchiectatic cavity. Following the last bronchoscopy, he became psychotic, developed convulsions and opisthotonos, soon passed into coma, and died. Cerebral embolism appeared to be the most likely diagnosis, and this was confirmed by ophthalmoscopic examination. Bubbles of air were seen streaming through all of the vessels of the left retina, with a few also visible in the vessels of the right eye.

The autopsy revealed the bronchiectasis. There was found a very small tear in the wall of a small vein. It is probable that the tear found was made by the bronchoscopic aspirator, and admitted the air into the circulation.

The findings in this case suggest that treatment should consist of keeping the patient's head down in an elevated bed, on any occasion when bleeding is seen to occur after deep instrumentation of the bronchial passages.

SAMUEL KAHN, M.D.

Cory, R. A. S.: Serious Hemorrhage During Closed Internal Pneumonolysis. *J. Thorac. Surg.*, 1944, 13: 32.

It is probable that large adhesions, particularly those which have been subjected to positive pressure pneumothoraces in order to stretch them and render them amenable to section, can, by their pull upon the chest wall, actually draw a loop of blood vessel which would normally lie in the parietal tissues into their parietal root. In such a case, section of the adhesion as near the chest wall as possible may open up a blood vessel of formidable proportions, and render immediate thoracotomy an absolute necessity.

In an attempt to divide dense apical adhesions, in the case reported, the subclavian vein, which had been drawn down by the adhesions, was cut. Immediate thoracotomy, with packing of the wound, stopped the hemorrhage. The patient recovered.

SAMUEL KAHN, M.D.

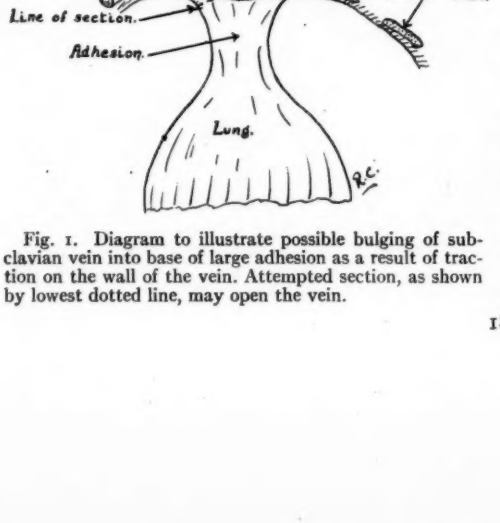


Fig. 1. Diagram to illustrate possible bulging of subclavian vein into base of large adhesion as a result of traction on the wall of the vein. Attempted section, as shown by lowest dotted line, may open the vein.

Campbell, R., and McLetchie, N. G. B.: Simple Polypoid Tumor of the Bronchus. Report of a Case. *Glasgow M. J.*, 1944, 141: 23.

The authors report a case of simple polypoid adenoma of the bronchus which was successfully removed by pneumonectomy. The tumor arose in the main bronchus and grew into the bronchus, carrying with it a covering of bronchial mucosa. The obstruction resulted in bronchial dilatation, infection of the bronchi, and pulmonary fibrosis.

The symptoms presented by the patient were a stabbing pain in the chest aggravated by deep breathing, and a slight cough which brought up white frothy sputum. There was no hemoptysis, breathlessness, or loss of weight.

Polypoid adenomas arise in the wall of a major bronchus and their growth is slow. The tumors eventually occlude the bronchus completely and extend proximally and distally, often sending little buds into branch bronchi. Usually there are no surface ulcerations. In some cases these tumors have been very vascular, and have produced repeated hemorrhages.

Goldman and Stephens and Foster Clark found that polypoid adenomas are more common in females than in males; bronchial carcinoma, on the other hand, is more common in males. Also, the age of patients with adenoma is found to be much lower than that of patients with cancer.

HOWARD A. MCKNIGHT, M.D.

ESOPHAGUS AND MEDIASTINUM

Ross, D. E.: Invagination Operation for Esophageal Diverticulum. *Am. J. Surg.*, 1944, 63: 3.

The author reviews briefly the salient features of esophageal diverticula, and presents case reports illustrating a method for inversion of the sac and repair of the orifice.

The invagination operation is recommended by the author because: (1) it allows the patient to be operated on in one stage; (2) the sac is not opened, so that the danger of infection is minimized; (3) the natural contractible character of the sac causes it to shrink and its presence in the pharynx causes no

trouble; (4) it adds another method of operating which may be used to advantage in selected cases; and (5) patients have had very satisfactory results and continue to enjoy perfect health.

The operation by invagination is described, as follows:

Anesthesia is accomplished by blocking off the skin with 1 per cent novocain, and by deep injection along the posterior border of the sternomastoid muscle. An incision of about 4 in. in length is made along the medial border of the sternomastoid muscle from the sternal notch upward and outward. The dissection then is carried between the sternomastoid and the infrahyoid group of muscles, and these are retracted to expose the lateral border of the thyroid gland. The middle thyroid vein and the inferior thyroid artery are ligated and divided. This permits medial retraction of the thyroid gland, and the carotid artery is retracted laterally, which exposes the esophagus. The sac of the diverticulum is then seen running down along the esophagus. The author has experienced no difficulty in locating this sac and bringing it up out of its bed with blunt dissection. The sac is seen to be covered with a thin layer of fascia which is stripped off with gauze dissection. A few small blood vessels run up into the neck of the sac. These are ligated and divided. The neck of the sac is cleansed with gauze to outline the muscle edges. These are seen to be quite clear-cut. The sac, which has now contracted down to a mere fraction of its former size, is invaginated into the pharynx and held there while the opening in the muscle is closed with interrupted sutures of silk. These are reinforced with a layer of fascia sutured over the area. If care is exercised in suturing, the mucous membrane should not be penetrated and there should be little or no cause for postoperative leakage. A small drain is left, however, as a precautionary measure, although in the author's cases no drainage was noted. The fascia of the neck is closed with No. ooo chromic catgut, and the skin is closed with clips.

No originality is claimed by the author for this operation. It is applicable to the vast majority of cases. Even large sacs become very small ones when emptied and freed from the surrounding layer of fascia. The contractile power is so great that it is surprising to what extent shrinkage will occur. Previously, it was believed necessary to do something with the sac; however, it is now considered unnecessary. It is not interpreted by the patient as a foreign body and it causes no trouble. As viewed with the laryngoscope, it is seen at first as a redundant fold of mucous membrane and in a few weeks it has a normal appearance.

The immediate postoperative recovery is exceedingly rapid. The operation causes very little general or local reaction as compared with other operations. The patient drinks fluids after a period of forty-eight hours, and the Reyfus tube is removed in thirty-six hours. There has been no recurrence in the author's cases.

CHARLES BARON, M.D.

Ferrari, R. C.: Transthoracic Esophagogastrostomy (Esofagogastrotomia por via transtoracica). *Bol. Acad. argent. cir.*, 1943, 27: 2.

In certain cases of functional or organic stenosis of the lower end of the esophagus the abdominal approach is difficult or dangerous on account of adhesions to the diaphragm or a relative shortness of the esophagus.

The transthoracic procedure is easier and leads to satisfactory functional results, as shown by 2 cases reported by the author. In both instances the esophagus was reached with the same technique, that proposed by Churchill for the resection of carcinomas of the cardia. A lateral anastomosis of the esophagus with the upper part of the greater curvature of the stomach, partially drawn in the pleural cavity, was performed.

The choice between the transthoracic and the abdominal procedure should be carefully made in each case.

EMANUELE MOMIGLIANO, M.D.

Watson, W. L., and Urban, J. A.: Mediastinal Lipoma. *J. Thorac. Surg.*, 1944, 13: 16.

Mediastinal lipomas usually arise in the mediastinum, and are often considered to be congenital in origin. Complete surgical removal is indicated, even though the tumor is asymptomatic when diagnosed.

Three types of thoracic lipomas have been described: (1) those limited to the thoracic cavity; (2)

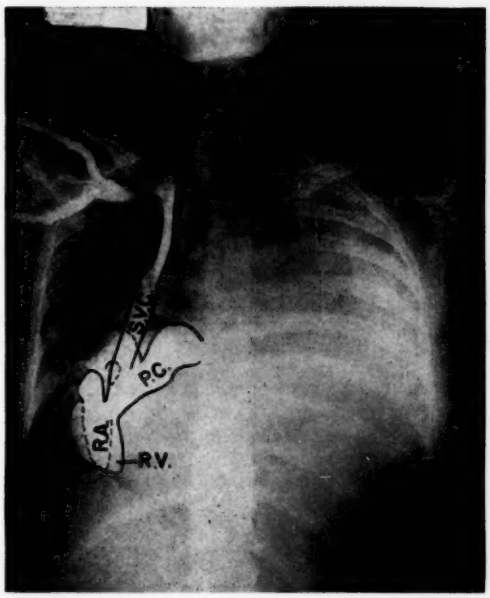


Fig. 1. Preoperative roentgenograph of chest with contrast visualization taken two seconds after injection. Dye outlines the superior vena cava, right side of the heart, and the pulmonary conus.

Fig. 2. The gross specimen. The total weight was 3,100 gm., or 6.8 lb.

those which extend into the neck; and (3) those with intrathoracic and extrathoracic portions connected by an isthmus through an intercostal space—the so-called "dumbbell type." Occasionally they reach gigantic proportions.

The signs and symptoms of intrathoracic lipoma vary according to the size and position of the tumor. Dyspnea, chest pain, cough, hemoptysis, and hoarseness are among the commoner symptoms. Cyanosis, edema of the extremities, and cardiac arrhythmias sometimes occur. In the case reported, dysphagia and epigastric pain were present in addition to the usual symptoms of dyspnea and pain situated in the chest.

Present-day treatment of benign intrathoracic neoplasms is very encouraging. Success is dependent largely on early diagnosis and surgical intervention, while the tumor is still operable. In 34 cases previously reported, only 12 tumors were successfully excised.

A case of intrathoracic lipoma is reported, in which the tumor arose from the mediastinum, was entirely intrathoracic, and weighed 6.8 lb. It was successfully excised. The operative procedure and laboratory studies are carefully described.

SAMUEL KAHN, M.D.

MISCELLANEOUS

Mackler, S., and Graham, E. A.: Aneurysm of the Ductus Botalli as a Surgical Problem. *J. Thorac. Surg.*, 1943, 12: 719.

Aneurysm of the ductus arteriosus has been reported infrequently. Because of the difficulty of differentiating this lesion from mediastinal tumor, it is of clinical significance.

In a review of 29 cases of aneurysm of the ductus Botalli collected from the literature, only 5 cases were reported as having occurred in an adult.

The authors report an additional case in which the diagnosis was made preoperatively. The patient was a twenty-three-year-old white male referred to Barnes Hospital, St. Louis, Missouri, with a diagnosis of mediastinal tumor. There was no history suggestive of congenital heart disease. Two years prior to his admission the patient was in an automobile accident, but he had sustained no severe injuries. About eight months prior to his admission he developed an ache over the right lumbar spinal area. At that time an x-ray examination of the chest revealed the mediastinal lesion for which he was referred to the hospital. On examination there were no significant findings except in the thorax, and this was only found on x-ray examination. His blood pressure was from 120 to 130 systolic and from 80 to 90 diastolic. The x-rays showed a rounded shadow in the region of the conus arteriosus on the left side of the heart, measuring from 6 to 7 cm. in diameter, and dislocating the trachea to the right. On lateral view, the mass was located posteriorly to the trachea. From the history and evidence on examination, a diagnosis of aneurysm of the ductus arteriosus was made.

Exploration of the mediastinum was made through the anterior approach, and the tumor was exposed after retraction of the lung. The bulge of the aneurysm was about the size of the "top of an orange." It was located just above the conus of the origin of the pulmonary artery and was wedged under the aortic arch. It was slightly pulsatile, and on the introduction of a needle fresh blood was aspirated under pressure.

Because of the size and inaccessibility of the aneurysm, it was deemed too hazardous to remove it. The wound was closed, following which the patient made an uneventful recovery. The diagnosis was based chiefly upon the age of the patient, the history of trauma, and upon the characteristic position of the mediastinal mass on x-ray examination.

WILLIAM E. ADAMS, M.D.

Ladd, W. E., and Bill, A. H., Jr.: Actinomycosis of the Chest with Spread to the Abdomen. *N. England J. M.*, 1943, 229: 748.

The older literature shows a poor prognosis for actinomycosis of the chest, in contrast to the somewhat better prognosis for the abdominal cases and the considerable better prognosis for the cervicofacial group.

In the last five years a number of reports of successful treatment of actinomycosis with sulfonamides have appeared. The cases reported were treated with sulfanilamide or sulfapyridine; sulfathiazole was used in only 1 case, in which it was unsuccessful after a very short course of therapy.

The rationale of the sulfonamide treatment of actinomycosis has been studied by Cutting and Gebhardt, who have shown that the growth of actinomyces hominis in vitro is inhibited by the drugs. Of the drugs studied by these authors, sulfathiazole and sulfadiazine were found to be about equally effective and to be more effective than sulfanilamide in similar concentration.

On the strength of this study and because of the low toxicity of sulfadiazine, this drug was used in the treatment of the authors' case, a nine-year-old boy complaining of draining sinuses of the back and right flank. Sixteen months before admission the patient had developed a cough and fever. This continued until fourteen months before admission, when an egg-shaped swelling appeared on the right chest posteriorly. This swelling was drained and proved to be an abscess. Surgical and medical measures were undertaken, and during the next twelve months the patient underwent six operations for drainage of persistent and spreading abscesses on the posterior chest and in the right flank.

Physical examination showed a feverish, emaciated, and apprehensive boy weighing only 49 lb. He was occasionally seized with paroxysms of coughing. The back was honeycombed with sinuses interspersed with raw areas of granulation. Thick, yellow pus could be expressed from the sinuses. One sinus extended into the right flank, apparently beneath the liver, for the length of a Kelly clamp.

X-ray examination of the chest on admission showed cardiac enlargement, bilateral pleural effusion, and increase in the lung markings in the lower two-thirds of each lung field. Portions of the 10th and 11th ribs had been resected on the right. The temperature reached 102° or 103°F. each evening, and the patient was frequently shaken with a severe nonproductive cough.

Sulfadiazine (0.5 mgm.) was administered six times a day. The temperature fell to normal after five days of this therapy and remained normal subsequently. The drainage became negligible within two weeks. After six weeks the back was dry and epithelized. The sulfadiazine dose was cut to 0.5 mgm. four times a day. After eight weeks the patient was walking, and subsequent to this his convalescence was uneventful. For eight months after discharge sulfadiazine was continued at a dosage of 1.5 mgm. daily. Five months after admission and about one month after discharge, there were no abnormal findings in the chest.

JOSEPH K. NARAT, M.D.

Olsen, A. M., and Wilson, G. T.: Chylothorax. *J. Thorac. Surg.*, 1944, 13: 53.

Chylothorax may be of traumatic or nontraumatic origin. The clinical syndrome is quite different in the two varieties. The symptoms of chylothorax following injury to the thorax present a characteristic pattern, but chylothorax of nontraumatic origin is most often insidious in onset.

The diagnosis of chylothorax rests chiefly on examination of the pleural fluid. The demonstration of excess fat in the pleural fluid is pathognomonic of chylothorax. Chylous ascites and, more rarely, chylopericardium may occur in association with chylothorax.

The prognosis of chylothorax is generally poor. In the nontraumatic forms, the serious nature of the primary process, which most frequently is malignant neoplastic disease, is responsible for the fatal outcome. In cases in which the course is protracted the loss of protein in aspirated chyle results in lowered osmotic pressure of the blood and extensive edema may occur. The mortality rate of chylothorax of traumatic origin is about 50 per cent.

There is no satisfactory method of treatment for chylothorax. Inasmuch as 50 per cent of the patients who have chylothorax of traumatic origin recover spontaneously, it is difficult to evaluate the various methods of therapy. Treatment of chylothorax of nontraumatic origin is usually unsatisfactory because of the serious nature of the underlying disease.

Nine cases of chylothorax have been recognized at the Mayo Clinic. Seven of these 9 cases were under observation at the clinic in the period from December, 1942 to November, 1943, inclusive.

It is believed that chylothorax occurs much more frequently than is generally recognized. Careful observation of the pleural fluid and a few simple tests are required to make the proper diagnosis.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Shall Bassini Die? *Lancet*, Lond., 1944, 246: 55.

Misgivings concerning the results of operation for inguinal hernia have been increased by observations made in the examination of recruits for the Services. Edwards tells of 805 recurrent hernias operated on in military hospitals during six months of 1942, and he estimates that these probably represent only 60 per cent of the patients with this condition presenting themselves in that short period. They were representative of the results of British surgery as a whole.

Faulty technique certainly accounts for a proportion of failures, and the time has come for surgeons to accept the fact that the operation is difficult and worthy of all their skill and patience. However, the type of operation may also be at fault. Bassini's operation, or one of its modifications, is used almost as a routine measure, and its supremacy may not be justified.

During nineteen months Arthur and Capper personally operated on 131 recurrent hernias in men of military age. In 86 of them it was possible, with reasonable certainty, to recognize the original method of repair: in 53 it was the Bassini method; in 19 the sac only had been excised; in 14 other methods, such as Bloodgood's, had been used. In cases treated by the Bassini operation the internal oblique muscle was represented by a thin sheet of attenuated muscle, pale brown in color. This finding supports the contention that suture of the internal oblique to Poupart's ligament is unphysiological, distorts the musculature, and, by interfering with its contraction, actually weakens the abdominal wall at the inguinal canal.

Removal of the sac alone has long been the usual operation in children, in whom any further repair has been regarded as surgical interference; but dissection of the sac from its coverings must be complete, otherwise the stump will be an easy starting point for a fresh hernia. For adults this is recognized as the most important step in the operation; but when there is a gap in the posterior wall, some method of strengthening the inguinal canal must be devised.

Discarding the Bassini type of repair, Edwards proposes a choice of two methods. One is to dissect a flap of the anterior layer of the sheath of the rectus abdominis, which is then hinged downward and attached with interrupted stitches to the upturned edge of Poupart's ligament; this he advised only for the infrequent direct hernia. The other is to darn the gap in the inguinal wall with a Gallie fascial graft.

Edwards is less concerned, however, with methods than with results.

It is now evident that "routine" treatment of hernia cannot be relied on to cure the condition, and Edwards is right in urging that the patient with hernia presents a problem deserving thought as well as care. After operation active treatment is still needed. Three weeks in bed is required, but within a day or two of operation the patient should begin graduated exercises to restore muscle tone. The custom in the Army is to provide three weeks in bed, three or four weeks in a convalescent home, and, finally, four or five weeks in a convalescent depot where eventually the soldier is restored to full physical efficiency. CHARLES BARON, M.D.

Iason, A. H.: Repair of Urinary-Bladder Herniation. *Am. J. Surg.*, 1944, 63: 69.

Urinary-bladder hernia is either a complication or an integral part of an inguinal hernia. Various statistical studies reveal an incidence of from 1 to 3 per cent. For recurrences following inguinal herniоplasties some surgeons give a percentage as high as 25.5.

The author offers the following classification of bladder herniation, based primarily on the surgico-anatomical aspect: (1) hernia which is part of a direct inguinal hernia through Hesselbach's triangle, without evidence of an indirect inguinal sac; (2) hernia which is a complication of an indirect inguinal hernia without direct connection between the bladder protrusion and the indirect inguinal component; (3) hernia which is the medial part of a large saddlebag or pantaloon hernia in which the lateral bladder-wall protrusion is part of the medial wall of an indirect hernial sac; (4) recurrent inguinal hernia (so-called) which is frequently an incompletely repaired saddlebag or direct inguinal hernia; and (5) femoral bladder hernia.

Bladder herniation is more frequent in men, and in both sexes it shows a distinct predilection for the right groin. The condition may be associated with a hernia of other organs on the same or opposite side of the body. There is, as a rule, a history of a long-standing, large, irreducible hernia which perceptibly diminishes in size after urination or catheterization.

Urinary symptoms, oddly enough, are not always characteristic features of bladder herniation. If urinary symptoms are present (dysuria, frequent or infrequent urination, and unusual tenderness over the protrusion), they are usually due to complications. The patient urinates at intervals, or only when he assumes a certain position or presses on the tumor mass. The last named indication is highly suggestive of the condition.

As to the diagnosis, routine cystographies are advisable for all patients past fifty years of age with inguinal or femoral hernia. A cystoscopic and roentgenographic examination will furnish evidence of value. When catheterization is resorted to, it will prove to be an important diagnostic aid because the mass will disappear.

During the surgical repair it is well to be extremely circumspect regarding an undue collection of adipose tissue and tissue simulating adipose tissue adjacent or contiguous to the hernial protrusion, but commonly medial to the sac; and with regard to isolation of the sac, which will not, as a rule, prove easy. The hernias are likely to be extremely large or massive, and protrude from preternaturally large rings; ordinarily, they are found closer to the medial abdominal line than other varieties.

The author had been in the habit of eliminating the bladder redundancy either by a double purse-string inversion or by a double layer of interrupted Lembert sutures, and then following the ordinary technique used for a direct or indirect inguinal hernia.

However, there were too many recurrences of the bladder protrusion and therefore he devised the following procedure:

The repair of the bladder hernia is the same in the five varieties. In the second variety, the small, indirect hernial sac must be removed first, prior to the repair of the bladder protrusion. In this sequence there is no danger of contamination because the bladder has been not only completely emptied by catheterization at least twenty-four hours before the surgical intervention, but irrigated several times with a weak antiseptic solution. The catheter is not removed until seventy-two hours after the operation. In the third variety, traction is made on the indirect component of the sac (as in the repair of all saddlebag hernias). The bladder protrusion is partly displaced medially and the indirect hernial sac is opened so as to permit visualization of the extent of the encroachment on its wall and to avoid puncturing the bladder in the transfixion of the indirect hernial sac.

The following technique is then used for the repair of the vesical hernia:

The base of the diverticular protrusion is caught by several Allis clamps and the redundant part is excised. After hemostasis is established, the edges of the stoma are inverted by means of a Connell stitch, which is reinforced with interrupted Lembert sutures of No. O chromic catgut on an atraumatic needle. The margins of the transversalis fascia are then approximated and sutured with interrupted strands of No. O chromic catgut. The hernial repair is then continued with the utilization of one of the techniques commonly acceptable in the repair of direct inguinal hernia. About 5 gm. of sulfanilamide powder are insufflated into the wound before closure of the skin. The catheter, a No. 16 French of soft rubber, remains *in situ* for seventy-two hours. It is sterilized and reintroduced for another twelve hours. The bladder may be irrigated daily with a warm sterile solution of boric acid followed by the instillation of 3 dr. of a 2 per cent solution of mercurochrome.

There have been no recurrences in the author's series of 37 cases. There was 1 wound infection, and no urinary extravasation in the surgical area.

JOSEPH K. NARAT, M.D.

GASTROINTESTINAL TRACT

Jacobson, L. O., and Palmer, W. L.: The Effect of Anemia on Gastric Emptying. *Gastroenterology*, 1943, 1: 1133.

In a study directed toward the role of gastric emptying upon oral-glucose-tolerance curves in pernicious anemia, it has been noted that an occasional patient with pernicious anemia in relapse may have a markedly prolonged gastric emptying. The purpose of this communication is to report an attempt to determine whether the seeming relation between anemia, gastric emptying, and symptoms is coincidental or real.

Patients with pernicious anemia in relapse, the same patients after return of the blood count to normal following therapy, and a group of patients with pernicious anemia who had been under control for from months to years were utilized for this study. The controls consisted of a group of normal medical students and an additional group of patients with from moderate to severe anemia, the etiology and pathogenesis of which are not fully understood. With barium sulfate (33 per cent by volume) and water as a medium of contrast, in an amount calculated after 4 cc. per kgm. of body weight was arbitrarily fixed as the total amount to be administered, the gastric emptying time was determined fluoroscopically.

The gastric emptying time in the normal male students and in the patients with pernicious anemia under treatment and in full remission varied from two to four hours. Significant prolongation in gastric emptying time occurred with one exception in patients whose peripheral erythrocyte count was below 1,500,000. This relationship was not confined to patients with pernicious anemia, but was found in other severe anemias of unrelated etiology. The majority of patients with severe anemia and with prolonged gastric emptying time had from mild to severe abdominal complaints. Abdominal symptoms in patients with pernicious anemia, whose blood count is adequately maintained, are relatively uncommon. In general, the abdominal symptoms in these cases disappeared quickly and completely and the gastric emptying time returned to the range found in the normal controls after institution of adequate therapy. There is little need for hydrochloric acid, and in patients with persistent digestive symptoms management has been reasonably successful with a regime identical to that used in the management of spastic colitis. The delay in gastric emptying in patients with severe anemia probably represents only one more manifestation of the general anoxemia. If this were the only mechanism involved, however, it would be difficult to explain the observation that delayed gastric emptying may be present, yet passage through the small bowel is comparable to the controls.

The gastric emptying time seems to be influenced profoundly by a great variety of items, such as hunger, fasting, tobacco smoking, drugs, the character

and quantity of material introduced into the stomach, electrical stimulation of the hypothalamus in the cat, vagal stimulation, and emotional states. Certain disease processes, because of the anatomical factors, may delay emptying. On the other hand, certain disease processes, notably peptic ulcer, may greatly increase gastric motility and shorten gastric emptying time.

Contrary to general belief that gastrointestinal motility is increased and the passage of material from the stomach and through the intestinal tract is accelerated in pernicious anemia, evidence is presented that these functions are either normal or delayed in severely anemic individuals in relapse. It is also apparent that achlorhydria per se does not significantly affect the rate of gastric emptying.

LEROY J. KLEINSASSER, M.D.

St. John, F. B., Swenson, P. C., and Harvey, H. D.: An Experiment in the Early Diagnosis of Gastric Carcinoma. *Ann. Surg.*, 1944, 119: 225.

Of 1,204 patients with gastric carcinoma, who were admitted to the Presbyterian Hospital, New York City, during the period from 1908 to 1942, 231 underwent resection. There were 64 operative deaths. The 167 patients who survived were discharged following radical surgery, and in less than 15 per cent of these there was the possibility that the disease had been arrested, since in many cases the surgeon knew that he had left tumor tissue *in situ*, and the pathologist had found tumor cells at the borders of the resections.

The authors believe that this record can be improved by:

1. A more alert attitude on the part of the physician who first sees the patient, as early diagnosis leads to early surgery.
2. Better technique by the radiologist and gastroscopist.
3. Willingness of the surgeon to operate when some suspicion of carcinoma still exists.
4. Wider resections, and resections of tumors formerly considered inaccessible.
5. A lower operative mortality rate.

The mortality rate in the authors' cases dropped from 33.8 per cent for the years 1908 to 1937, to 17.9 per cent for the years from 1938 to 1942, and to 4.7 per cent for the year of 1942. The resectability rate was increased from 14.8 per cent for the years 1908 to 1937, to 36.5 per cent for the past five years. The authors attribute this improvement to their observance of the afore-mentioned factors. Another factor in obtaining good results would be the possibility of operating upon patients without metastases. The importance of this fact is demonstrated by the following figures:

Of 97 patients on whom resection was done prior to April, 1938, 25 (25.8 per cent) lived for a period of five years or longer; of these, only 4 were known to have metastases at the time of operation. These 4 patients were the only survivors in a group of about 900 with presumable metastases, which emphasizes the importance of early diagnosis. Improvements in the authors' methods of examination were demonstrated by the fact that prior to 1938 6 per cent of the cases were without metastases, while during the past five years nearly 10 per cent were without metastases.

Early diagnosis is a crying need in the effort to save lives. Mass studies similar to those which have been carried out in tuberculous patients should be undertaken also in the cases of those suspected of having gastric lesions. The authors have made such a study.

The method used consisted of a rapid fluoroscopic examination of the stomach with the patient in the erect position only, unless something suspicious was shown in the fundus, in which event the patient was examined in the prone position also. Admittedly, the examination depends upon the ability of the roentgenologist.

As a result of their studies of 2,413 cases, the authors found 3 proved cases of unsuspected malignant gastric tumors (2 carcinomas and 1 lymphosarcoma), i.e., 1.24 cases per 1000. Five other patients underwent gastric resection because of suspicious signs of carcinoma, but only benign single or multiple ulcers were found. An additional 15 patients were subjected to careful study, as the fluoroscopic examinations were suggestive, but their lesions were considered benign and they were not subjected to operative exploration. Five hundred and twenty-eight functional and organic abnormalities, other than cancer, were found. Deformed duodenal bulbs were present in 54 individuals, but there were no symptoms of ulcer. The records showed 7 cases of cardiospasm, and 25 cases of diaphragmatic hernia; there were also anomalous positions of the stomach and duodenum, diverticula of the stomach and duodenum, evidence of gastritis, and 1 case of polypus of the stomach. There were 90 cases of abnormality within the thorax, and occasional gallstones were discovered.

In conclusion the authors state: "Whether this method is a practical one for reducing the large number of incurable gastric carcinomas that come to our hospitals, we cannot yet say. At least one thing should come of it, if nothing else, and that is an opportunity to learn more about the characteristics of early gastric carcinoma, for our experience so far has, unfortunately, been chiefly with its late manifestations."

MATHIAS J. SEIFERT, M.D.

Hagood, M. M.: Treatment of Perforated Peptic Ulcer—Report of 36 Cases. *J. M. Ass., Georgia*, 1944, 33: 12.

Perforation of a gastric or duodenal ulcer into the peritoneal cavity occurs with dramatic suddenness, and, unless treated surgically, progresses in a typical course until the death of the patient occurs two or three days after the perforation. It is one of the most easily diagnosed acute abdominal conditions, and the most important to diagnose early and treat promptly by surgical intervention.

If operation be undertaken within the first six hours, recovery is the rule; if it be delayed for twelve hours, recovery is doubtful; if twenty-four hours elapse before operation, death is probable.

The incidence of peptic ulcer is increasing, and the frequency of acute perforation is becoming disproportionately greater.

The signs and symptoms produced by the perforation vary according to the time which has elapsed since the rupture occurred. The initial symptom is the onset of acute abdominal pain, followed quickly by boardlike abdominal rigidity.

In the series of 36 cases reported, there were 35 males and 1 female. The greatest number of perforations occurred in the fourth decade. The gross mortality of this series was 11 per cent. The immediate mortality in acute perforation is dependent on many factors: the interval between perforation and operation, the type of operation, and the age and condition of the patient.

The type of surgical procedure done in the majority of these cases was a simple suture of the perforation, reinforced by a tag of omentum over the perforation; if the perforation and surrounding ulcer-bearing area was large, a muscle graft was taken from the rectus muscle and sutured over the indurated and inflamed area.

The complications encountered were hemorrhage in 2 cases, generalized peritonitis in 7 cases, pneumonia in 3 cases, evisceration in 2 cases, subphrenic abscess in 1 case, and psychosis in 1 case.

Prior to operation, patients were typed and matched for transfusion, and were given large doses of morphine, stimulants, and glucose and saline solution, intravenously. During the operation, they frequently received blood transfusion. In the majority of cases in which gross soiling of the peritoneum occurred, no drainage was employed, but the abdomen was cleansed by the use of suction, and sulfanilamide powder was instilled into the abdomen and pelvis. Postoperative treatment consisted of nothing by mouth for twenty-four hours, morphine given freely, fluids given intravenously, and blood transfusions when indicated; the latter were given when the patient was still in good condition, on the early appearance of the signs of shock. On the second day, a half ounce of sterile water was given every hour, and intravenous fluids were continued. If signs of distention occurred, a Levine tube was inserted into the stomach. Large doses of sulfadiazine were given orally and intravenously. Two thousand cubic centimeters of 10 per cent glucose were given daily. On the third day, 1 oz. of sterile water was given every hour. On the fourth day, small amounts of strained cereal, orange juice, and cooked custard were given, and water was given freely. On the fifth day, a first-stage Sippy diet was started.

The anesthesia used was nitrous oxide and ether, and spinal anesthesia. The latter is the method of choice. It gives greater relaxation and provides the best possible operating conditions.

SAMUEL KAHN, M.D.

Wakeley, C. P. G.: Late Results of Perforated Peptic Ulcer. *Lancet*, Lond., 1944, 246: 11.

The late end-results of perforated peptic ulcers in 103 patients operated on at the Haslar Royal Naval Hospital between 1924 and 1934 were carefully studied by the author. The investigation was requested by the Medical Director-General of the English Navy in 1941. The importance of this order is emphasized by the fact that since the bombing of Britain began, the incidence of perforated peptic ulcer has been increased in both sexes among the civilian population as well as among the personnel of the fighting forces.

The author considers the mortality of 8 per cent a remarkable record. The average age of these patients was thirty-two years. The good results were due to the fit physical condition of the men, the time factor of the operation, the average being four hours after the perforation, and the sound surgical skill of the medical officers of the Navy.

In contrast, Wakeley collected 102 cases of his own during the years from 1924 to 1934. The average age of these patients was forty-six years, the mortality was 20 per cent, and the time factor averaged ten hours, while in some instances it was as much as eighteen hours after the perforation.

Comparison of the two series brings out the following facts:

1. The "follow-up" in naval cases is easier than in civilian cases; 5 per cent of the former and 22 per cent of the latter were untraced.

2. Fifty-four per cent of the Service cases and 51 per cent of the civilian cases were of gastric origin.

3. Forty-five and one-half per cent of the perforated duodenal ulcers in Service cases and 49 per cent of those in civilian cases were operated upon.

4. Death occurred from reperforation after some years in 2 per cent of both series.

5. Death occurred from other causes after some years in 8 per cent of the Service cases and 23 per cent of the civilian cases.

6. Among the Service cases, 44 per cent of the patients are still in active service, while among the civilian cases, 20 per cent are still active.

These facts prove quite clearly that perforated peptic ulcer should not invalidate Service men, nor should a history of perforation necessarily mean a refusal by recruiting medical boards. The prognosis in perforated cases is better than in any other form of peptic ulcer. In the Royal Navy today it is unusual to lose such cases, and the operative mortality is about 1 per cent. These results are due to the preliminary treatment by means of Ryle's tube which is immediately applied and used until the operation is begun. This ensures physiological rest for the stomach and reduces the peritoneal soiling to a minimum, and, at the same time, affords the necessary opportunity for treating shock, making laboratory examinations, preparing the operating room, and performing any other procedures which are indicated.

At operation a right paramedian incision is made and the perforation is located. Debris is removed by

suction and a simple closure of the perforation is made, the suture being covered with an omental graft. No other surgery is attempted at this time. It is surprising how a reduced duodenal lumen returns to normal size in from two to three weeks after operation, as has been proved by x-ray photographs. In the rare cases of stenosis a gastroenterostomy can be done later under ideal conditions with excellent results.

Another invaluable factor for decreasing the mortality is the use of sulfanilamide in the peritoneal cavity and in the abdominal wound. This sterile powder is quite safe in amounts between 12 and 15 gm. which are spread over the wounds.

Finally, subphrenic abscesses following perforated peptic ulcers are almost entirely eliminated by:

1. Putting the patient in Fowler's position.
2. The local use of sulfanilamide.
3. Making the patient breathe "carbogen" 3 times daily for four days after operation. (Carbogen is a gas composed of oxygen and carbon dioxide [93 to 7 and 95 to 5], used in an H. H. inhalator.—A. M. A.) The carbogen makes the patient breathe deeply, and thus causes the diaphragm to undergo full excursions, and also prevents collapse of the lungs.

MATHIAS J. SEIFERT, M.D.

McHardy, G., and Browne, D. C.: Duodenal Ulcer Concomitant in Identical Twins. *J. Am. M. Ass.*, 1944, 124: 503.

Theoretically, identical or uniovular twins contain "identical determiners" in their chromosomes: they are always of the same sex. They always have similar physical characteristics, often exhibit the same mental pattern, and pathological departures of close contrast are not unusual.

Although the medical literature reveals case reports of diverse and seemingly innumerable pathological entities which are common to identical twins, no reported instance of a duodenal ulcer occurring in one, or in both, was found.

In the authors' case of duodenal ulcer concomitant in identical twins, aged twenty-eight years, one of the twins was hospitalized and adhered to a medical regimen and achieved an asymptomatic phase of eight months. Relaxation of his regimen resulted in melena, obstructive symptoms, and intractable pain. A subtotal gastrectomy was done.

In this twin, all of the postgastrectomy symptomatic complications occurred—postgastrectomy asthenia, loss of weight, quantitative dyspepsia, gastrocolic reflex with intermittent diarrhea, secondary anemia, and achlorhydria—despite a gastroscopically and roentgenologically mechanically-perfect resection. No symptoms of recurrent ulcer developed in an eighteen-months follow-up, nor did any improvement in the symptoms occur despite diet, hydrochloric acid, liver and vitamins given parenterally, and other measures.

The other twin refused hospitalization and has followed, indifferently, an ambulatory ulcer regimen. He had one mild episode of melena on three occasions. He put himself to bed on a modified Sippy regimen because of pain and persistent vomiting.

The surgical experiences of the one affected the decisions of the other. The first patient has gastrointestinal discomfort despite acceptable management while the other has active ulcer symptoms.

The authors have added to the medical literature a pathological entity occurring in identical twins; namely, duodenal ulcer, which may lend support to the hypothesis of constitutional predisposition.

JOHN E. KIRKPATRICK, M.D.

Judovich, B., and Dunn, J.: Persistence of Pain after Appendectomy. *Am. J. Surg.*, 1944, 58: 246.

The authors suggest that persistence of right lower quadrant pain in the abdomen following appendectomy is due to neuralgia of the abdominal wall. They urge that treatment be directed to the spine and paravertebral nerve trunks, rather than to peripheral zones of pain distribution, or to the abdominal viscera. A case is cited in which the chief complaint of pain in the right lower quadrant had not been relieved by appendectomy, but was relieved by orthopedic correction of the patient's spinal deformity, the apparent causative factor, combined with paravertebral infiltration and diathermy.

EDWARD W. GIBBS, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Packard, G. B., and Stevenson, A. W.: Hepatoma in Infancy and Childhood. *Surgery*, 1944, 15: 292.

The authors report a case of hepatoma in a child thirteen months old, and review a number of similar cases in the literature. Treatment was exclusively surgical; the standard technique of removal of the tumor, and the experiences of various surgeons with this problem are reported. The authors' case was considered a carcinoma of the liver of the hepatoma type. After a period of less than two years the condition recurred.

EMIL C. ROBITSHEK, M.D.

Stevenson, C. A.: Emphysematous Cholecystitis. *Am. J. Roentg.*, 1944, 51: 53.

Emphysematous cholecystitis is an acute infection of the gall bladder characterized by gas production in the gall-bladder lumen, walls, and pericholecystic tissues. Any virulent gas-producing organism may produce the disease when favorable local conditions exist. Such a lesion has been recognized many times by surgeons and pathologists, but the roentgenological demonstration of this condition is rare.

The most probable sequence of events in the production of emphysematous cholecystitis is:

a. Lodging of a stone in the cystic duct

b. Resulting decrease in the local resistance of the gall-bladder tissues which allows the avirulent bacillus welchii to become virulent

c. Increased number of the gas bacilli in the bile and gall-bladder wall

d. Production of gas in the gall bladder, emphysematous blebs in the loose areolar connective tissue of the gall-bladder wall, and extension of the infection to the pericholecystic tissues

The disease differs from other acute infections of the gall bladder in that it cannot specifically be identified by clinical examination; however, it has a typical roentgenological appearance. It usually terminates fatally.

The author reports 3 cases in which gas in the gall bladder, blebs in the wall, and collections of gas in the pericholecystic tissues were demonstrated. No gas was demonstrated in the biliary-duct system. Two cases were confirmed by operation and 1 was treated medically. All 3 patients survived. There was no evidence of gas gangrene elsewhere in the patients. The presence of gas in the gall-bladder lumen alone is not sufficient for the diagnosis of emphysematous cholecystitis, as cases of biliary fistula commonly show gas in the gall bladder.

The author concludes that roentgenograms of the gall-bladder region are of distinct value in cases of acute cholecystitis. EARL O. LATIMER, M.D.

Huergo, M., Creahg, J., Castro, O., Fernandez, E., and Vazquez, G.: Emergency Cholecystectomy in Acute Cholecystitis (La colecistectomia de urgencia en la colecistitis aguda). *Rev. med. cir. Habana*, 1943, 48: 491.

The authors report 3 cases of acute cholecystitis operated on fourteen, eighteen and thirty-six hours, respectively, after the onset of symptoms. The first patient was a woman fifty years of age, the second a man sixty years old, and the third also a man, forty-eight years of age. Both the diagnoses and operations presented no difficulties. All of the operations were performed under spinal anesthesia. In 2 cases an occlusion of the cystic duct by a stone, and in the third case by an inflammation of the wall was present. In 2 cases signs of gangrene of the gall-bladder wall were visible macroscopically, while in the third case a microscopic examination demonstrated disseminated zones of necrosis of the mucosa although only fourteen hours had elapsed since the onset of the symptoms.

The authors consider cholecystectomy as the ideal operation for acute cholecystitis, provided that less than forty-eight hours have passed since the onset of the symptoms.

As a rule, a diagnosis of acute cholecystitis does not offer any difficulties and an operation is well tolerated. The authors insist that the operation be performed within the first twenty-four to forty-eight hours because a delayed operation is much more serious on account of pericholecystitis, which forms a mass consisting of the colon, omentum, stomach, duodenum, and common duct.

Saint coined the term "obstructive cholecystitis" in 1943. The obstruction is the result of an impaction of a stone in the neck of the bladder or in the cystic duct, and edema of the walls of these organs. If the condition is irreversible, its association with infection is followed by an increase of the intravisceral pressure, which in turn leads to an interference with the blood supply, gangrene, perforation, and peritonitis. Inasmuch as no one can predict whether an obstruction is reversible, an immediate operation is advocated by the authors.

JOSEPH K. NARAT, M.D.

Vadheim, J. L., Gray, H. K., and Dockerty, M. B.: Carcinoma of the Gall Bladder. A Clinical and Pathological Study. *Am. J. Surg.*, 1944, 63: 153.

Clinical records in 77 surgical cases of carcinoma of the gall bladder were secured and carefully analyzed for pertinent clinical and laboratory data and surgical end-results. The pathological specimens then were obtained and studied carefully in gross detail. In 2 cases specimens were not available for pathological examination. In 65 of the 75 cases in which specimens were available, the entire gall bladder was studied. Special attention was paid to the site, size, and consistency of the lesion, the presence of regional lymph nodes and any adventitious tissue, the presence or absence of gall stones, and to other factors. In all, more than 300 sections were made available for study.

Carcinoma of the gall bladder has been reported to occur most frequently in the sixth decade of life; 45 per cent of the authors' series of patients were in this decade of life. There were 61 women and 16 men in the group, a ratio of approximately 4 women to each man.

Stones were associated with the carcinoma in 88 per cent of the cases, and that they definitely preceded the development of the carcinoma was evident in 58.5 per cent of these cases. An analysis of the early symptoms revealed nothing which could not be attributed to the presence of chronic inflammation of the gall bladder with or without cholelithiasis.

The classification of these carcinomas was: adenocarcinoma, 85.3 per cent: squamous-cell carcinoma, 2.7 per cent; and adenoacanthoma, 12.0 per cent. Three instances of malignant degeneration in a papilloma, and 1 in an adenoma were found. The finding of areas of metaplasia in the mucosa and of adenocarcinoma and squamous-cell carcinoma in the same tumor lends support to the theory of metaplasia for the origin of a squamous-cell carcinoma.

Five-year cures were obtained in 45 per cent of the cases of carcinoma of grade 1, in 4.3 per cent of those of grade 2, and in none of those of the other grades. In no instance was a definite diagnosis made preoperatively.

Lionello, J., Ficarra, B. J., and Ryan, N. H.: Pancreatic Calculi: Report of 7 Cases in 2 of Which Cure Was Effected by Pancreaticolithotomy. *Arch. Surg.*, 1944, 48: 137.

There have been 225 cases of pancreatic lithiasis reported in the literature, exclusive of cases of pancreatic calcinosis. The authors report that they have encountered 7 cases, 2 being cured by pancreaticolithotomy.

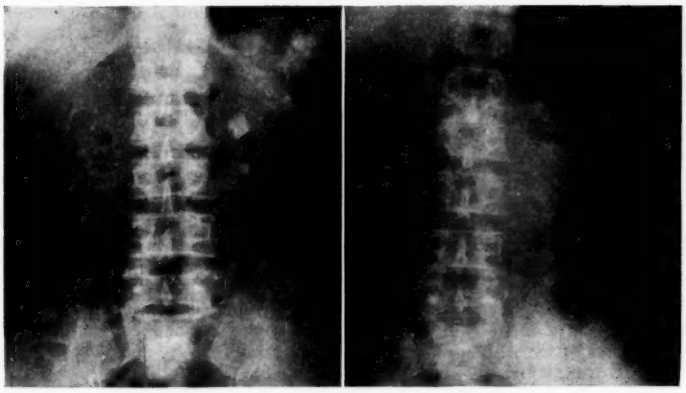


Fig. 1. Left, Preoperative roentgenogram showing calculi in the tail of the pancreas. Right, Postoperative roentgenogram showing absence of previous calculi.

While the exact cause of pancreatic lithiasis is not known, stagnation of the pancreatic juices secondary to chronic inflammation and sclerosis is a dominant factor. Pancreatic stones are composed chiefly of calcium carbonate and tribasic calcium phosphate. They are usually smooth and rounded, are often multiple, and have a tendency to fuse. The stones are most often found in the head of the pancreas, less frequently in the body, and rarely in the tail of the pancreas.

There is no typical clinical picture of pancreatic lithiasis. With the exception of roentgenological studies, the laboratory offers little aid in diagnosis. Five of the 7 cases in this report were diagnosed by means of roentgenograms. The site of the stone is in the upper part of the abdomen at the level of the second or third lumbar vertebrae. These stones are often mistaken for gall stones, renal calculi, or calcified lymph nodes.

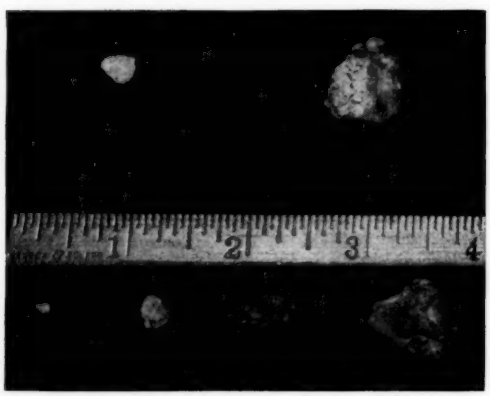


Fig. 2. Photograph of calculi removed at operation.

Two of the author's cases were diagnosed by means of roentgen studies and cured by surgical removal of the stones. Both patients were males, fifty-six and thirty-five years of age, respectively. Both had severe epigastric distress and pain. The stones in one were located in the head of the pancreas, in the other, in the tail.

Excoriation of the abdominal wall by the pancreatic juice drained from the site of operation was controlled by the local use of a mixture of equal parts of kaolin and olive oil. When the secretion of pancreatic juice appeared to increase, as demonstrated by drainage, ephedrine sulfate (24 mgm. or 3/8 gr.) was given three times a day. This reduced the output of pancreatic juice by causing vasoconstriction.

EARL Q. LATIMER, M.D.

Priestley, J. T., Comfort, M. W., and Radcliffe, J., Jr.: Total Pancreatectomy for Hyperinsulinism Due to an Islet-Cell Adenoma. *Ann. Surg.*, 1944, 119: 211.

In a case of hypoglycemia due to hyperinsulinism from a small adenoma of the islets of Langerhans, total one-stage pancreatectomy was performed. A less radical procedure would have failed to cure the patient, since the adenoma was located in the head of the gland, in intimate proximity to the duodenum. It is believed that this is the first case of total pancreatectomy for benign or malignant disease in which the patient has survived beyond the immediate postoperative period.

The operation was followed by relatively mild diabetes. Disturbance of the carbohydrate digestion was not detected by the methods used, but the digestion of protein and fat was definitely diminished. From 35 to 70 per cent of the ingested fat and from 25 to 55 per cent of the ingested nitrogen could be accounted for in the feces. A positive nitrogen balance occurred in spite of the large loss of nitrogen in the feces. Foodstuffs in the urine and feces ac-

counted for from 21 to 34 per cent of the calories ingested. The percentage of total fat in the stools as neutral fat varied from 54 to 69 per cent. The dried weight of the stools was greater than values obtained for healthy persons.

The patient has remained in excellent health, sixteen months after the operation. Evidence of deficiency of lipocaic has not developed.

MISCELLANEOUS

Frvin, R. L., and McLaughlin, C. W., Jr.: Rectus-Muscle Strains Simulating Acute Intraperitoneal Disease: 51 Cases at a Naval Training Station. *Naval Med. Bull*, 1944, 42: 172.

The authors present a study of 51 cases of strain of the rectus abdominal muscle, which were admitted to the hospital. The patients, usually admitted with a diagnosis of acute appendicitis (86 per cent of the cases involved the right side), presented a difficult diagnostic problem, but novocain infiltration of the affected muscle was valuable for the diagnosis and treatment.

The authors state that the factors predisposing to this injury are the lack of tendinous insertions in the lower fourth of the muscle, and the deficiency of the rectus sheath posteriorly. J. M. MORA, M.D.

Canby, C. B., Carpenter, G., and Ellmore, L. F.: Drepanocytosis (Sicklemia) in an Apparently Acute Surgical Condition of the Abdomen: Report of the Occurrence in a White Youth, with Laparotomy. *Arch. Surg.*, 1944, 48: 123.

In the classic case of sickle-cell anemia, described by Herrick, the patient suffered from attacks of abdominal pain, a feature that is now known to be characteristic of the syndrome. In several recorded instances the pain was so severe that, together with physical findings, it led to laparotomy. The occurrence of this condition is rare, and a similar case has not been previously reported in a Caucasian.

The present case is that of an American-born youth, of pure Sicilian stock, in whom an acute abdominal syndrome led to laparotomy with splenectomy. Examination of the spleen showed areas of acute necrosis of splenic tissue, which contained at their center an arteriole plugged with sickle-form red cells. There were present areas of older necrosis and other extensive areas of acute hemorrhagic necrosis.

The abdominal syndrome in drepanocytosis may closely simulate a number of patterns of acute abdominal disease. Ileus, perforated ulcer, appendicitis, acute cholecystitis, and pelvic inflammatory disease appear to be most commonly simulated. Splenic pain, presumably due to small infarcts in that organ during the stage of enlargement, is also common, but it does not often reach the severity noted in this case.

At the height of the painful episode, there may be no anemia, no icterus, and no frank sickling of fresh blood. Leucocytosis, however, appears to be common, and it is probable that reticulocytosis would be found to be uniformly present, if suitable examinations were made. The technique of Hansen-Preuss, in which an oil-sealed, fresh, moist preparation is set up on a cresyl blue slide, will bring out sickling in about four hours in cases of the sickle-cell trait, and will also demonstrate reticulocytes. Such a preparation should be set up immediately when obscure acute abdominal syndromes are encountered in negroes and in Mediterranean caucasians.

Splenectomy done as an experimental therapeutic measure in cases of drepanocytic anemia neither cures the anemia nor prevents the hemolytic attacks. Symptomatic improvement in the anemia and in the frequency of the hemolytic or painful episodes may justify this undertaking, in cases in which there is great splenomegaly.

SAMUEL KAHN, M.D.

Benedict, E. B.: Peritoneoscopy in Liver Disease. *N. England J. M.*, 1944, 230: 125.

In 70 per cent of a series of 435 peritoneoscopies the question of liver disease arose. It is therefore evident that one of the chief uses of the peritoneoscope is the diagnosis of liver disease. In comparing peritoneoscopy with exploration it is pointed out that the former procedure requires only a 1-cm. incision under local anesthesia, and an overnight stay in the hospital with minimal risk or discomfort to the patient. In this series there were 3 deaths (0.73 per cent) attributable to the procedure.

Since jaundice and liver damage are frequent, preparation of the patient should include determination of the prothrombin time and administration of vitamin K if it is prolonged. Morphine and its derivatives, as well as the barbiturates, are to be avoided. Chloral hydrate may be safely substituted. The patient is prepared as for any laparotomy and the stomach and bladder are emptied. The usual site of puncture for inspection of the liver is in the midline just above the umbilicus.

These cases of liver disease could be divided into two groups—the malignant and the nonmalignant. In 71 cases of suspected liver disease an essentially normal liver was found. The diagnosis was metastatic carcinoma in 170, and cirrhosis in 73 patients, while the remainder had various diseases, including hepatoma, sarcoma, lymphoma, lymphangioma, Banti's disease, cholangitis, polycystic liver, echinococcal cyst, and sarcoid. A positive diagnosis of liver disease can be made by peritoneoscopic biopsy with only slight operative risk.

JOHN L. LINDQUIST. M.D.

Viacava, E. P., and Pack, G. T.: Significance of Supraclavicular Signal in Patients with Abdominal and Thoracic Cancer: A Study of 122 Cases. *Arch. Surg.*, 1944, 48: 109.

The significance of metastasis to the lymph nodes in the supraclavicular space, secondary to cancer originating in the abdominal and thoracic viscera,

has long been of interest to surgeons and pathologists. Virchow, in 1848, first recognized the necessity for a careful examination of the supraclavicular fossa in patients with abdominal tumors.

Of 4,365 patients with abdominal and thoracic tumors who were treated in the Memorial Hospital, New York, in the last two decades, only 122 (2.8 per cent) presented supraclavicular metastases. The diagnosis was verified in each instance by pathological examination, either by study of an excised node or by aspiration biopsy. The greater frequency of metastases to the left side (59.8 per cent) is explained by the relationship of the thoracic duct to the supraclavicular nodes on this side. Metastatic involvement of lymph nodes in the right supraclavicular space (25.4 per cent) is less frequent and occurs mainly in patients with tumors of the thoracic cavity. Bilateral invasion of the supraclavicular nodes (14.8 per cent) is also more commonly associated with thoracic than with abdominal cancer. In 81 patients, the signal nodes were invaded only in the advanced stages of the cancer and, in the majority of cases, generalized metastases appeared in other organs at the same time. In 41 patients the supraclavicular metastases constituted the first clinical sign of a malignant tumor and led to a search for the primary site of the cancer.

From their study, the authors draw the conclusion that the presence of a swelling or tumor mass in the supraclavicular fossa immediately stimulates an investigation to determine whether the cause is inflammatory or neoplastic. The origin of lymphadenitis, which occurs more commonly in young subjects, is usually not obscure. Tumors of the lymphoma group, such as reticulo-cell sarcoma and Hodgkin's granuloma, are differentially diagnosed by the general characteristics of their appearance, the possible coexistence of the systemic features of the disease, and by microscopic study of an excised lymph node representative of the lymphadenopathy. In the majority of patients over forty years of age, the appearance of a hard, firm lymph node in the supraclavicular fossa suggests the presence of secondary or metastatic cancer. Malignant tumors of the head and neck, and of the mammary glands as well, frequently metastasize to the supraclavicular regions.

Biopsy on tissue aspirated with a 17-gage needle inserted under negative pressure and with local anesthesia, may solve the problem of establishing a pathological diagnosis. In a series of 122 patients with involvement of the signal nodes by metastatic cancer, such biopsy was successful in obtaining a representative specimen of tissue in approximately 85 per cent of the instances. Biopsy on aspirated tissue should not be relied upon for the diagnosis of a tumor of the lymphoma group. Whenever the results of such biopsy were inconclusive and the general physical examination did not offer a satisfactory explanation as to the nature and origin of the disease, a formal biopsy on excised lymph-node tissue was carried out.

From a practical point of view, the patients with metastatic cancer involving supraclavicular signal nodes can be separated into two groups: (a) those with a known primary cancer at the time of admission, or with a primary cancer easily found at the time of the initial examination but undetected by the patients; and (b) those with obvious involvement of the signal nodes by cancer metastasis from an undetermined primary site. In the latter circumstance, the examiner should proceed to a detailed investigation in order to rule out or detect the presence of malignant tumors of the head and neck, the breast, the upper extremities, the skin, and the trunk, and should continue with the methodical exploration of the different organs of the abdominal and thoracic cavities from which cancer is capable of metastasizing to the cervical lymph nodes. A pathological diagnosis of metastatic adenocarcinoma or epidermoid carcinoma aids the clinical investigation considerably by determining a definite organ or system.

The only treatment considered worth while for metastases to the signal nodes secondary to abdominal or thoracic cancer is external irradiation by means of high-voltage roentgen rays, or the 4 gm. radium-element pack. As the treatment is palliative rather than curative, it is difficult to evaluate the advantages of the various modalities of irradiation, but the clinical impression exists (on a review of the end-results obtained) that the radium-element pack has proved superior to the ordinary high-voltage roentgen rays and the manner of their application in the treatment of supraclavicular metastases. Interstitial irradiation by deposition of gold radon seeds into the supraclavicular lymph nodes, either with or without surgical exposure by incision of the skin, is contraindicated because of the frequent intractable brachial neuritis which may ensue.

JOSEPH K. NARAT, M.D.

Shorter, A.: Early Rehabilitation in Abdominal Surgery. *Lancet*, Lond., 1944, 246: 243.

The author has evolved a plan of rehabilitation in abdominal surgery, based on the following suggestions:

Chest. After abdominal operations, most patients are afraid to breathe deeply, let alone cough, because deep breathing is painful and they are afraid of bursting their stitches. This fear is deeply embedded in the lay mind especially in relation to operations for hernia. It is a relic of the days when the hernia patient was kept flat on his back for three weeks after operation, and barely allowed to flicker an eyelid. However, if sutures give way in the first days after straightforward operations there is surely something wrong with the suturing, or the catgut.

The need for early clearing of mucus from the bronchial tree to prevent the "postoperative chest" is obvious; yet this need is seldom met adequately. Both coughing and breathing can be carried out soon after operation, under skilled instruction, with

great benefit. Coughing is relatively painless if the wound is held firmly, first by the instructor, and then by the patient when he has been taught to do it himself. It is essential to have a skilled instructor who can inspire confidence and allay the patient's fears; otherwise the patient will not co-operate. Coughing clears the airway, facilitates free breathing, and prevents collapse of lung tissue. The author has found it more effective than inhalation of carbon dioxide, which, by producing violent involuntary respiration, may even cause mucus to be sucked deeper into the lungs. Since substituting coughing and voluntary breathing, Shorter has noticed a substantial decrease in "postoperative chests" of all types after all kinds of operations, under all grades of anesthesia—general, spinal, or local.

Circulation. To prevent venous stagnation, thrombosis, and embolism, the patient has long been encouraged to move about in bed. But how many do much in this way during the first few days, except under direct supervision? Proper instruction minimizes these risks by maintaining a mobile circulation.

Muscles and joints. Muscle tone and joint efficiency can be maintained by early active movement of the trunk and limbs, beginning on the second or third day after operation unless it is definitely contraindicated. The author believes that early, gradually increasing, active movements—stopping short of pain—can do no harm to the patient as a whole or to the operation area. Avoidance of pain depends on skilled instruction and confidence. This early active treatment is the best way to maintain the general fitness of the patient, prevent the flabbiness that is usual after rest in bed, and do away with many of the minor ailments that accompany it, and thus shortens convalescence. After proper instruction the patient can practice movements frequently by himself. This is far better than half an hour's massage and passive stimulation by the masseur, who is better employed instructing than rubbing. A patient trained in bed can walk quite well on first getting up, and avoids the jelly-legs phase, formerly so common. Within a few days he goes to the gymnasium for further exercises and games, and the majority of patients are fit for discharge within a week of getting up. By the avoidance of muscle-wasting while in bed there is little leeway to be made up; he merely needs to become used to the change in posture and increased movements. In the author's cases, there has been no sign of weak scars or incisional hernias. The patient also escapes the pot-belly and intestinal stasis so general after rest in bed, as well as the abdominal belts sometimes prescribed. The latter should be reserved for paralyzed muscles and inoperable hernias, and never used for lazy or neglected muscles.

Morale. An instructed patient does not feel himself a helpless invalid who has to be waited on. He escapes boredom and preserves morale. He knows that he has a part to play in his recovery instead of lying inert in bed like a sack of potatoes, and this is a great boon to the nursing staff. Interest is maintained when he begins to feel fit, for the competitive spirit is soon introduced into his exercises and games. This can be done in the wards as well as in the gymnasium, and music is an invaluable adjunct.

In the prolonged cases occupational therapy may be needed to stimulate mental interests, and in all cases the aim is to achieve perfect co-ordination of mind and body and to restore the patient as nearly as possible to full health, strength, and usefulness. This can be achieved with all types of patients who must be encouraged and inspired, not bullied. Such skilled work must be carried out with intelligence and understanding, and is very suitable for the masseuse or masseur. J. M. MORA, M.D.

GYNECOLOGY

ADNEXAL AND PERIUTERINE CONDITIONS

Ahumada, J. C., Chevalier, R. M., and Sammartino, R.: Actinomycosis of the Ovary (Actinomicosis del ovario). *Bol. Soc. obst. gin.*, B. Aires, 1943, 22:7.

The authors give an accurate report of a case of actinomycosis of the ovary. The disease, affecting a twenty-three-year-old girl, developed acutely and was first mistaken for a gangrenous appendicitis. A drain was left in the McBurney incision.

The appendix could not be removed, because it was submerged in a large peritoneal abscess. Twenty days later another laparotomy was necessary because of a second peritoneal attack. A large collection of pus, extending into the cul-de-sac of Douglas, was evacuated. A fistula, secreting fetid fluid, developed after the second operation.

For a few months the symptoms subsided, and then a new attack of peritonitis developed. A third operation revealed only necrotic, gangrenous tissue. Microscopically, this was shown to be actinomycotic granulation tissue. Temporary improvement was followed, a year later, by a new inflammatory attack on the left side. At this time the left adnexa reached the size of an egg: the corresponding parametrium and paracolpium were of a ligneous consistency. The right tube and the appendix were finally removed and the left adnexa extirpated. The patient died a few days later with the signs of a subdiaphragmatic abscess. No autopsy was performed. The microscopic examination showed that the actinomycosis was confined to the left ovary.

More than 100 cases with involvement of the genital organs have been recorded. The disease can reach the uterus, the tubes and, more often, the ovary through (1) an ascending infection, (2) the blood stream, or (3) most commonly, through the intestines. In the last type of case the genital organs are involved both extraperitoneally, following the pelvic cellular tissue, and intraperitoneally, because of the formation of extensive adhesions. The symptoms may be acute, so as to simulate an appendicitis, or subacute, with fever, pains, and intestinal disturbances. The menstruation is affected only later.

The diagnosis is relatively easy when the infection reaches the external surface of the body, with fistulas or abscesses; however, it may become very difficult when the infection is closed, because of the resemblance to tuberculosis.

Complete recovery is rare; in different statistics it ranges from 10 to 40 per cent of the cases.

Surgical treatment is often palliative; a complete excision of the infected tissues is seldom possible.

Fair results have been obtained with x-ray and radium therapy. Several drugs and vaccines have been tried. Recently, thymol (65 centigrams three times a day for a two-week period) has been advocated. EMANUELE MOMIGLIANO, M.D.

Barros, N. M., De Godoy, P., and Delascio, D.: Ovarian Goiter (Struma do ovario). *Obst. gin lat. amer.*, B. Air., 1944, 2: 114.

The authors report a case of thyroid tumor of the ovary, also called "ovarian goiter." This strange blastoma is exceedingly rare. The first case was described in 1889 by Gottschalk. The tumor is known under various names, such as "strumoid teratoma of the ovary," "colloidal ovarian goiter," and "aberrant goiter of the ovary." One may speak of an ovarian goiter only if the thyroid tissue predominates in the tumor. The incidence of thyroid tissue in teratoma of the ovaries is not infrequent.

As to the histogenesis, some writers consider the ovarian goiter as a metastasis of a hyperplastic thyroid gland, while others regard the ovarian goiter as a teratoma. The author shares the last opinion. Some writers advance the hypothesis that the ovarian goiter represents an adenomatous formation of the superficial epithelium of the ovary and that the goiter results from a colloidal degeneration of a pseudomucinous cystoadenoma.

An ovarian goiter may reach the size of a newborn's head and usually has a spheric, ovoid, or cylindrical shape. According to the literature, only 2 cases were bilateral. The consistency ranges from elastic to cartilaginous. Usually the goiter has a fibrous capsule.

The authors recommend Wegelin's classification which divides the goiters into two groups: diffuse and nodular; both groups may be subdivided: (a) parenchymatous and (b) colloid.

Of 100 cases of ovarian goiter collected from the literature, only 9 showed a functional activity. This can be demonstrated in 3 ways: (1) as histological evidence, (2) by the chemical demonstration of iodine, and (3) by the biological demonstration of an active thyroid substance; it has been shown that thyroid tissue administered to rats prevents the results of poisoning with acetonitrile.

The symptoms of an ovarian goiter are not characteristic unless evidence of a functional endocrine activity in the form of thyrotoxic manifestations is present. Ascites appears in approximately 50 per cent of the cases. As a rule, neither menstrual disorders nor any other somatic changes are present. Usually, only a diagnosis of solid or cystic ovarian tumor is made. In the majority of cases the evolution of the condition is benign, although occasionally metastases in the omentum may develop as has been observed in pseudomyxoma.

The author reports a case of ovarian goiter in a thirty-nine-year-old woman in whom a diagnosis of solid tumor of the right ovary had been made. An encapsulated tumor 4.5 by 5.3 by 8 cm. in diameter was removed. The microscopic examination established the diagnosis of a macrofollicular proliferating colloid ovarian goiter. JOSEPH K. NARAT, M.D.

MISCELLANEOUS

Tompkins, P.: The Use of Basal-Temperature Graphs in Determining the Date of Ovulation. *J. Am. M. Ass.*, 1944, 124: 698.

A simple method for determining the time of ovulation has been discovered, but unfortunately it has not been brought to the attention of clinicians at large. It is based on variations in body temperature during phases of the menstrual cycle.

A record of body temperatures taken daily under standard conditions shows a typical curve during the menstrual cycle. The temperature is relatively low during the first part of the month, drops to a minimum about the time that ovulation occurs, and rises definitely thereafter to a relatively high level, which is maintained until the next menses, when the temperature drops abruptly. Before the menarche, after the menopause, and in men, similar temperature fluctuations are not found. If conception occurs, the temperature will remain at the high postovulation level. The important feature is the rapid rise in temperature at ovulation.

In this work it is essential to secure good graphs, and these are not forthcoming until the patient has a clear idea of what is wanted, and why. It will not suffice for the physician to instruct the patient orally or to tell her to "write down the temperature every day" or to "draw a graph." A list of figures is not sufficiently meaningful to patient or doctor; from the practical standpoint it is essential to plot the data as a graph. Further, the graph must be planned so that the temperature variations are readily apparent. The secret of the method is to give the patient proper graph paper forms and complete written instructions. The instructions should read:

Take temperature rectally with a blunt tip rectal thermometer for five minutes by the clock immediately after waking in the morning and before arising, eating, drinking, or smoking.

Note the temperature immediately by a dot on the graph.

Any recognized cause for temperature variations should be noted on the chart, for example, a cold, grip, indigestion, or even a hangover.

It is not essential to take the temperature during menstruation. Mark the first day of menstruation at the extreme left of the chart and commence a new graph when the flow has diminished.

It is necessary to continue the graph for at least two menstrual months before it can be considered of much value.

If the temperature shows a rise of two- or three-fifths of a degree, and if this rise corresponds with a similar rise in the previous menstrual month and is not due to illness, then it can be assumed that ovulation is occurring and that intercourse is most likely to be fruitful. Intercourse oftener than once in twenty-four hours is probably unnecessary.

The graphs may also be used to detect the "unsafe period" for those who do not use contraceptive measures.

DANIEL G. MORTON, M.D.

Faulkner, R. L.: The Blood Vessels of the Myomatous Uterus. *Am. J. Obst.*, 1944, 47: 185.

The distortions in the blood vessels of the myomatous uterus were studied by means of anatomical methods which allowed the direct inspection of the blood supply. The intrinsic vessels of the tumors themselves were studied also.

The fact that most myomas are a mass of proliferating arteries and contain few or no veins within their substance was confirmed. No normal myoma had only one nutrient artery. The frequent arteriolar tufts seen in corrosion specimens were pointed out as evidence that a rich capillary bed probably existed and emptied toward the periphery of the tumor. No evidence was found to indicate that the blood entered and left a myoma by arterial channels. Free arteriovenous anastomoses were encountered four times in 60 specimens but probably these were tumors injured at operation. Even overinjection of the arteries does not fill the lymphatics in or around myomas.

EDWARD L. CORNELL, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Balfour, M. I.: Supplementary Feeding in Pregnancy. *Lancet*, Lond., 1944, 246: 208.

In a feeding experiment covering 10 areas in the north of England and 18 in South Wales, 11,618 pregnant women received food supplements consisting mainly of vitamins A, D and B-complex, and calcium, phosphorus, and iron. They were compared with 8,095 pregnant women who received no such supplements. Both groups were getting extra milk in some form.

There was a significant reduction in the stillbirth and neonatal mortality rates of the fed group as compared with the controls. Maternal deaths in the series were too few for any conclusions to be drawn.

CHARLES BARON, M.D.

Corr, J. E., Wagner, W., and Hetzer, M.: Intravenous Administration of Amino Acid in Nephrotic Toxemia of Pregnancy. *Am. J. Obst.*, 1944, 47: 70.

This article describes in detail the management of a patient with nephrotic toxemia complicated by heart disease. In the fourth month of pregnancy the patient appeared acutely ill. Edema and pallor were marked, the blood pressure was 144/96, and the temperature was normal. Presystolic and systolic murmurs could be heard at the mitral area, but the liver edge was not palpable or tender, and the lung bases were clear. A catheterized specimen of urine gave a 4+ reaction for albumin.

The essentials of the treatment are shown in the following tables:

Vitamin, calcium, and iron therapy was instituted, and 2 cc. of vitamin C were administered parenterally every day. On March 25, because of the patient's distaste for protein, her diet was changed. The carbohydrate and fat intake remained the same (C, 300; F, 50), but the protein was decreased from 160 to 100 gm. per twenty-four hours and the administration of amino-acid solution was begun. After the administration of the amino acid was started, the serum proteins increased from 3.9 to a high of 4.8, then they decreased to 4.4 and remained at that, or a slightly lower, level, until after delivery by cesarean section on May 9, when the level rose to 4.8 gm. per 100 c.c. of blood. Clinically there was marked improvement after the amino-acid treatment was begun. The patient became more interested in her surroundings and very enthusiastic and co-operative. The edema, which had shown no noticeable

TABLE I.—INTRAVENOUS AMINO ACIDS IN NEPHROTIC TOXEMIA OF PREGNANCY

Date	Infusions	Diet (C 300, P 50)	Average total protein per day	Plasma protein gm./100 cc.	Hgb.	R.B.C.
Jan. 19 to Mar. 24	2,750 cc. plasma 2,800 cc. whole blood	P 160	165†	2.45 to 3.9	10.8 (62%)	3.01
Mar. 25 to May 3	45 gm. amino acids/day*	P 100	145	3.8 to 4.8		
May 4, 5, 7, 8	90 gm. amino acids/day	P 100	190	4.4 to 4.2	11.6 (68%)	3.36
May 6	400 cc. whole blood	P 100	115†	4.4		
May 9 (Operation)	45 gm. amino acids			4.1		
May 10 to 21	45 gm. amino acids/day	P 100	145	4.8		
May 23 (Discharged)	650 cc. whole blood	P 100	125†	4.8	11.3 (66%)	3.0
Oct. 13				6.44	14.3 (84%)	4.0

*6 days of 7.
†Plasma calculated to contain 7% protein. Whole blood 54% plasma.

TABLE II.—RENAL FINDINGS

Date	Albuminuria				
	Urea		Quantity gm./24 hr.	Urine cc./24 hr.	Weight pounds
	Clearance	Quality			
Jan. 19 to Mar. 24	54 cc. (100%)	4+	7.5 to 12.5	450 to 1,000	132 increasing to 135
Mar. 25 to May 3		4+	8.3 to 14.2	1,000 to 2,250	135 decreasing to 126
Oct. 13	61 cc. (110%)	3+	5.9	1,400	112

change during the plasma and blood transfusions, decreased about 40 per cent during the amino-acid regime, and cleared entirely by the sixth day following delivery of the baby, except for slight ankle edema. The daily urine analysis showed a 4+ reaction for albumin. The red blood cells observed per high power field varied from 2 to 50, the white blood cells from 10 to 100, and casts of the hyaline, granular, and cellular types were seen occasionally. A biweekly twenty-four-hour specimen showed from 11 to 14 gm. of protein per liter. During the plasma and blood transfusions, the fluid output varied between 500 and 900 cc. per twenty-four hours. There was no noticeable increase in the output following the plasma transfusion. Upon intravenous administration of the amino acid, the output was increased to a low of 1,680 cc. and a high of 2,630 cc. per twenty-four hours. On the days when the amino acid was not given, the output varied between 585 cc. and 860 cc. per twenty-four hours.

The patient was delivered one month before term by cesarean section, of a 4 lb., 15 oz. baby which lived. The patient was followed up at monthly intervals after discharge. She seemed well, and was carrying on regular housework and caring for her baby. Monthly urine analyses gave from 2 to 3+ reactions for albumin. Two twenty-four-hour specimens revealed from 5 to 6 gm. of protein per liter of urine.

EDWARD L. CORNELL, M.D.

Miller, H. C., Hurwitz, D., and Kuder, K.: Fetal and Neonatal Mortality in Pregnancies Complicated by Diabetes Mellitus. *J. Am. M. Ass.*, 1944, 124: 271.

The fetal mortality in pregnancies complicated by diabetes mellitus is about 30 per cent, and the cause remains obscure. The use of insulin has not given a lower mortality. Infants born of diabetic mothers may have cardiac hypertrophy, large numbers of nucleated red cells in the peripheral blood soon after birth, hyperplasia of the islands of Langerhans, and are apt to be overweight. The fact that this syndrome is sometimes present before the onset of signs and symptoms of diabetes indicates that the anatomic changes are not related to the hyperglycemia in the mother.

The material for this study was obtained from the hospital records of all diabetic pregnant women and their offspring admitted to the Boston Lying-in Hospital, the New Haven Hospital, and the New York Hospital, since 1930, 1928, and 1933, respectively, and did not include any case in which the fetus weighed less than 1,000 gm.

The findings of these authors show that the belief is no longer tenable that hyperglycemia of the mother causes the larger number of fetal deaths, the excessive weight of some of the infants, and the hyperplasia of the islands of Langerhans. Fetal deaths and the birth of unusually large babies occur with about the same incidence before the diabetes becomes manifest as afterward. This is true also of the hyperplasia of the islands of Langerhans, the cardiac hypertrophy, and the excessive erythropoiesis in the fetal liver. Many explanations are still needed before the relationship between fetal production of hyperglycemia in the mother is clarified.

The material presented shows that there is an increased fetal and neonatal mortality even from fifteen to twenty years before the clinical symptoms and signs of diabetes can be recognized, and the findings in the dead infants are the same as those of infants borne by mothers with hyperglycemia. It shows also that the size of the fetus per se is not the cause of fetal death because the mortality rate is no higher among the infants who weigh 4.5 kgm., or more, at birth than among those who weigh between 2.5 and 4.5 kgm. Also, the fetal mortality in the presence of mild diabetes not requiring insulin and in the absence of other maternal complications of pregnancy is four times higher than that in the nondiabetic population.

The presence of glycosuria in the last months of pregnancy in women whose carbohydrate metabolism is otherwise apparently normal is associated with a fetal and neonatal mortality that is as high as that among the offspring of women with definite diabetic symptoms. CHARLES E. GALLOWAY, M.D.

Maino, C. R., and Mussey, R. D.: Carcinoma of the Cervix Coincident with Pregnancy. *Am. J. Obst.*, 1944, 47: 229.

A study of 3,570 cases of carcinoma of the cervix observed at the Mayo Clinic within a period of approximately thirty-two years revealed that pregnancy was present in 26, or 0.7 per cent, when the carcinoma was found. This figure does not necessarily indicate the true incidence of carcinoma of the cervix coincident with pregnancy, as all of the 3,570 patients came to the clinic because of carcinoma of the cervix and not because of pregnancy. In the same period covered by this study, 8,500 pregnant women were observed at the clinic.

The average age of the patients in the 26 cases in which carcinoma of the cervix was coincident with pregnancy was thirty-two years. The youngest patient was 25 years of age and the oldest was 41 years of age. The prognosis was no worse in the case of young patients than it was in cases in which the patients were older.

The average number of previous pregnancies was 6, and the average number of children was 4. The number of pregnancies apparently did not affect the prognosis. In cases in which the carcinoma was diagnosed in the later months of pregnancy, the lesion usually was well advanced and the prognosis was poor.

Pregnancy may occur after carcinoma of the cervix has developed. A family history of carcinoma was elicited in 7, or 35 per cent, of the 20 cases which were observed five or more years prior to 1941. The prognosis in these 7 cases was better than the prognosis in the remainder.

Bleeding was the initial symptom in 23, or 88.5 per cent, of the cases. In 25 per cent of the cases,

the patients did not realize that they were pregnant when the diagnosis was made.

No definite conclusions can be drawn concerning the relative value of irradiation therapy; however, it appears that operation is preferable in cases in which the lesion is operable and that supplementary irradiation increases the percentage of good results. This is in contrast to the relative value of irradiation therapy and hysterectomy in cases of carcinoma of the cervix in which the patients are not pregnant.

The authors are in general agreement with Strauss concerning treatment of carcinoma of the cervix coincident with pregnancy. If the extent of the lesion permits operation and if the fetus is not yet viable, total hysterectomy is followed by irradiation; if the lesion is operable and the fetus is viable, cesarean section is followed by panhysterectomy and postoperative irradiation.

In cases in which the lesion is nonoperable and the fetus is viable, cesarean section is followed by irradiation; in cases in which the lesion is nonoperable and the fetus is not yet viable, sufficient irradiation is employed to treat the lesion; incidentally, abortion occurs.

In cases in which the lesion is operable, total abdominal hysterectomy has produced the best results. In 57 per cent of the cases in which this procedure was employed, the patients were free of recurrence five years after operation.

In this series of cases of carcinoma of the cervix coincident with pregnancy, many of which were observed before the present methods of treatment were developed, the prognosis appeared to be at least as favorable as the prognosis of carcinoma of the cervix that is not associated with pregnancy. Of the 20 patients who were followed up, 30 per cent were free of recurrence five or more years after treatment.

NEWBORN

Langley, F. A., and Stratton, F.: Hemolytic Disease in the Newborn; the Rh Factor. *Lancet*, Lond., 1944, 246: 145.

The authors studied 19 infants with hemolytic disease and 2 with congenital hydrops and compared them with 41 babies with physiological jaundice. Among the abnormal cases, jaundice was present in 14, severe anemia in 3, and hydrops in 2. In all there occurred a progressive fall in hemoglobin to below the expected normal. Postmortem examination of 11 of the babies showed findings typical of erythroblastosis fetalis; a twelfth infant appeared to have died from a transfusion reaction.

In all cases of hemolytic disease the infant's blood was Rh positive and all except 1 of the mothers was Rh negative. Anti-Rh agglutinins were demonstrated in the blood of 19 mothers. In 7 of 10 cases examined, agglutinins were found in the breast milk.

Among the cases of physiological jaundice, 36 of the mothers were Rh positive and no agglutinins were found; of the 5 Rh-negative mothers 1 had agglutinins. J. ROBERT WILLSON, M.D.

Potter, E. L.: The Lessons to be Learned from a Study of Infant Deaths. *J. Am. M. Ass.*, 1944, 124: 336.

Birth rates, total death rates, and death rates for infants under one year of age have all shown a gradual decline during the years for which statistics are available. In 1915 the birth rate for the United States was 25.0 per 10,000 estimated population; in 1940 it was only 17.9. The death rate under one year dropped from 99.9 per thousand live births in 1915 to 48.7 in 1940. Had the infant death rates for 1915 prevailed in 1940 there would have been approximately 123,000 more deaths under one year of age during that year than actually occurred.

Deaths under one month of age have decreased at a slightly less rapid rate (35.5 in 1927; 29 in 1940) than those under one year, and those under one day have shown almost no decrease since 1927 (15.1 in 1927; 13.9 in 1940). Under one year of age the decrease has been most striking in gastrointestinal infections and communicable diseases. Infants under one month of age are less affected by these conditions, and those under one day of age not at all.

The factors concerned in infant deaths are manifold and include the genetic constitution of the parents, their state of health, their social status, the environmental emotional and physical state of the mother during pregnancy, the length of gestation, the position of the fetus in utero, the length and conduct of labor, the method of delivery, the presence of abnormalities in the uterus, placenta, and umbilical cord, the immediate postnatal care of the infant, and the later care of the infant.

In order to do the greatest amount of good, those states which most frequently contribute to an unfavorable outcome should be first attacked. The three major fields into which effort must be directed are those necessary to control the three major causes of neonatal deaths—prematurity, birth trauma, and infections.

PREMATURITY

Prematurity is a direct cause of approximately one-fourth of all deaths occurring under one month of age and is a contributing factor in at least an additional one-fourth. The ideal method of decreasing the number of deaths from this cause would be in preventing the premature onset of labor; however, no one has succeeded in doing this except in a few isolated cases and it is necessary, therefore, to improve the environment into which the infant is born if its chances of survival are to be increased.

The immediate reason why the majority of otherwise normal premature infants die is inability to obtain oxygen through the inadequately developed lung. The nearer the infant is to term the greater is the capillary area which is in direct contact with the alveolar lumens. If the number of capillaries in contact with the air and capable of receiving oxygen is too small to support life, the infant cannot survive.

The kidneys in a premature infant are incompletely developed at birth. Glomerular development con-

tinues until about the thirty-fourth or thirty-sixth week of intrauterine life, and prior to this time an incomplete complement of glomeruli is present. Even at the normal time of birth, tubular development is very incomplete and in the premature period the infant is handicapped by greater immaturity of the tubular system.

In order to provide the infant with the greatest chance of survival it is necessary to place it in an environment which will compensate as far as possible for the incompleteness of development. The higher the percentage of oxygen which is present in the inspired air, the greater the absorption which is possible. The more easily assimilable the food which is given, the less will be the effect of incompletely developed digestive glands. Human milk is the food of choice for all premature infants.

To give the premature infant the greatest chance for survival it should be under the care of a physician who is cognizant of its special needs, and of an attendant who is specially trained to take care of it. It should be in a place where constant heat is available for maintenance of body temperature, where humidity can be controlled, where oxygen can be administered, and where breast milk is available. It should be disturbed as little as possible and kept free from the possibility of infections.

BIRTH TRAUMA

Birth trauma is the second principal cause of death which properly directed effort should be able to reduce. Intracranial hemorrhage is the most common form of fatal injury and is almost always due to abnormal pressure on the head. This may result from cephalopelvic disproportion, abnormal position of the head, abnormalities of uterine contractions, or the improper application of forceps. Hemorrhage may occur despite the most careful observation of the patient and the application of the greatest skill in the management of labor and delivery.

Any attempt to decrease the number of birth injuries must be primarily directed toward improved education of the physician and improvement of the environment in which birth is accomplished. By expending effort in this direction, decreases in the number of deaths from other causes will also be brought about. The greater the skill of the obstetrician, the better will he be able to cope with all emergencies, and the fewer will be the deaths from all causes attendant on labor and delivery.

INFECTIONS

The third principal cause of death is infection. The lungs are the part of the body most frequently involved, although in some localities there is still a high incidence of umbilical and cutaneous infections. Epidemic diarrhea takes an annual toll of lives which might be prevented. The elimination of all pathogenic bacteria from the environment of the infant during delivery and after birth should be attempted.

Except for malformations, the other conditions leading to infant death occur with considerably less frequency. Although syphilis accounts for relatively few deaths in most communities, it is one cause that could be completely eliminated. Abnormal fetal development, in our present stage of knowledge, is almost the only condition which is not susceptible to amelioration.

Our greatest need at the present time is for greater dissemination of information which is already available. When one states that the causes of infant death are little understood, it is merely an indication that one is little interested in understanding. If all infants could be delivered by skilled obstetricians in places suitable for birth and could be subsequently cared for in a way known to give the best chance for survival, the general death rates would greatly decrease. J. ROBERT WILLSON, M.D.

MISCELLANEOUS

Page, E. W.: The Excretion Rates of Histidine in Pregnant and Nonpregnant Women. *West. J. Surg.*, 1943, 51: 482.

The alterations of histidine metabolism in normal and toxemic pregnancies are not satisfactorily explained and any further investigation must be based upon quantitative excretion rates. Qualitative tests upon random urine samples have little value as diagnostic procedures or for the purpose of studying pathological alterations.

The present report is concerned with the details of a suitable quantitative method, and with the histidine excretion rates in some normal pregnant and nonpregnant subjects, both before and after the oral ingestion of pure histidine. The highest values seem to occur between the third and the eighth months of gestation, and during this period the oral administration of histidine results in a much greater increase in the excretion rate than it does in the nonpregnant woman. It seems likely, however, that the excretion rates fall markedly during the last two weeks before delivery. The determination of the excretion rate after histidine administration gives some promise of yielding an increased accuracy in the histidine test for pregnancy. CHARLES BARON, M.D.

Boyer, N. H., and Nadas, A. S.: The Ultimate Effect of Pregnancy on Rheumatic Heart Disease. *Ann. Int. M.*, 1944, 20: 99.

The report of these authors is based upon a study of patients admitted to the charity wards of the Massachusetts Memorial Hospitals, the Boston City Hospital, and the Massachusetts General Hospital during the years 1930 to 1941, inclusive. The study includes only those patients who lived until at least the beginning of the reproductive period, which is arbitrarily set at eighteen years of age. One hundred and three patients who had had one or more pregnancies, and 49 patients who had never been pregnant conformed to the criteria set forth, and were available for study.

The authors state that although the immediate risk of pregnancy in women with rheumatic heart

disease has been admirably surmised by others, the ultimate effect of the circulatory load of repeated pregnancies, and of the hardships of motherhood upon a handicapped heart has not been subjected to the same thorough analysis. Other authors had expressed the opinion that there was no strong evidence pointing toward an unfavorable late effect of pregnancy on the course of rheumatic heart disease, but they had no statistical proof to offer and even doubted that such proof could be obtained in a practical way.

Seven tables are presented, 4 of which are arranged to show the average age at the time of death from congestive heart failure in various groups of women, and 3 show the average weight of the heart and its measurements.

The results obtained by these authors are in accord with those of others who have made similar studies with regard to the lack of evidence pointing toward a deleterious effect of pregnancy in patients with rheumatic heart disease. Their conclusions are as follows:

"The average age at death from congestive heart failure is significantly older for women who have borne children than for those who have had no pregnancies, when all cases eighteen years of age, or older, are considered. This is accounted for by the fact that the nulliparous control group is not comparable to the parous group because of death early in the reproductive period of a large number of those who had not been pregnant.

"When only those patients are considered who lived to approximately the end of the reproductive period, i.e., forty years of age, there is no significant difference in the average age at death of the nulliparous or parous women. Furthermore, multiple pregnancies (4 or more) cannot be shown to reduce the average age at death.

"There is no significant difference in the average age at death for males and females with rheumatic heart disease whether the groups are considered as a whole or are subdivided according to the valves affected (exclusive of affection of the aortic valve alone) and the presence of auricular fibrillation. Accordingly, males can be used as a control group for parous women, thus obviating certain objections to the use of nulliparous women as controls.

"Consideration of postmortem data did not reveal that the increased load of pregnancies and motherhood produced any appreciable increase in cardiac hypertrophy.

"It is concluded, therefore, that pregnancy has no delayed deleterious effect on the course of rheumatic heart disease." CHARLES E. GALLOWAY, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Lowsley, O. S., and Menning, J. H.: Pelvic Single Kidney; Report of Case. *J. Urol.*, Balt., 1944, 51: 117.

The case of a single pelvic kidney is reported and the previously reported 35 cases are briefly reviewed. Genital abnormalities were seen in half of them.

The case presented was that of a lad seven and one-half years of age who was hospitalized repeatedly for pyuria from 1936 to 1942. The patient was then examined with the cystoscope but no ureteral orifice was found on the left and the corresponding trigone was ill defined. The right kidney was catheterized and the intravenously administered phenolsulfonphthalein appeared in six minutes; 10 per cent was excreted in ten minutes. Retrograde pyelography showed a dilated renal pelvis and ureter, and markedly delayed emptying time. The films showed obstruction at the ureterovesical junction probably of congenital origin.

Surgery was decided upon and the kidney was approached extraperitoneally through a right-rectus incision. The kidney was found enlarged with good parenchyma. The ureter was coiled and enlarged and was dissected out. The bladder was incised and the previous cystoscopic findings were confirmed. A probe in the right ureterovesical junction permitted an incision and a stenotic intramural portion of the ureter was observed. A nephropexy was performed

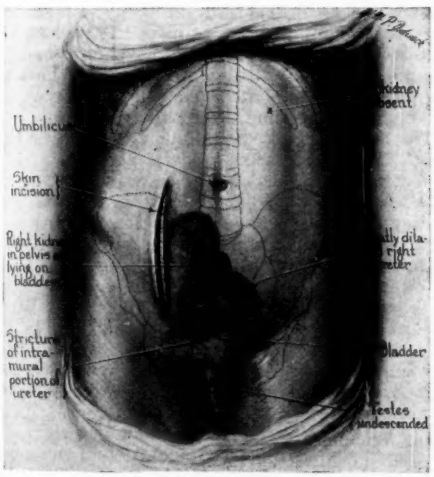


Fig. 1. Shows condition present before operation, and position of skin incision to expose kidney. Right kidney low in pelvis, resting on bladder; ureter greatly dilated and very tortuous. Testes undescended. Left kidney absent.

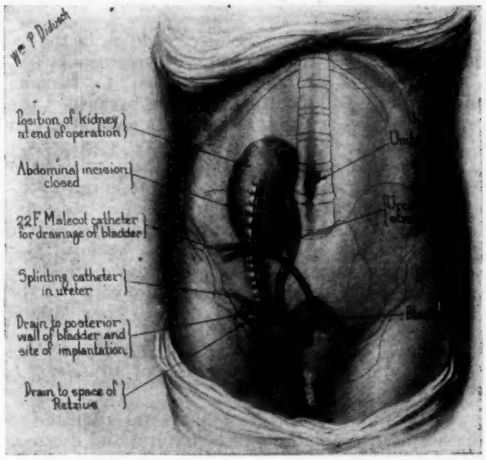

Position of kidney at end of operation
Abdominal incision closed
22 F. Malecot catheter for drainage of bladder
Splinting catheter in ureter
Drain to posterior wall of bladder and site of implantation
Drain to space of Retzius

Fig. 2. Operation completed, drains placed, and wound closed; kidney in high position and ureter straight.

and a redundant section of the ureter 8 cm. in length was excised. The ureter was reimplanted into the bladder at the original site of the intramural segment. A 18-F. catheter was introduced into the renal pelvis and used to splint the ureterovesical implantation. A Malecot catheter was used to drain the bladder, and the space of Retzius was drained as well as the posterior wall of the bladder at the site of the ureteral implantation.

The postoperative course was uneventful. The patient was discharged on his forty-ninth postoperative day and his blood urea nitrogen was 11 mgm. per 100 cc. of blood as compared to 22 mgm. on admission. The urinalysis was normal. Four months after operation the kidney contained no residual urine but the ureterovesical orifice was quite patulous. Retrograde studies revealed that the renal pelvis and calyces were not dilated and that there was only a minimal retention in the kidney after ten minutes. Similar findings were recorded on examination fifteen months following surgery. Intravenous pyelography showed prompt excretion of dye as compared to the original excretory rate of 40 per cent of phenolsulfonphthalein in three hours.

ROBERT LICH, JR., M.D.

BLADDER, URETHRA, AND PENIS

Hyams, J. A., and Weinberg, S. R.: Hyperplastic Change at the Vesical Neck in the Female. *J. Urol.*, Balt., 1944, 51: 149.

A study of hyperplastic change at the vesical neck in the female based on a review of the embryology,

a study of postmortem material, and clinical investigation of the female urethra is presented.

In isolated cases, periurethral tubules and a female prostate were found, but were without clinical significance.

The most constant pathological finding in the female urethra was that of cystic degeneration.

Inflammation, if present, tended to become chronic and was difficult to eradicate because of the presence of these cysts in the transitional epithelium of the urethra.

Hyperplastic change at the vesical neck in the female was relatively frequent. Its presence was associated with marked urinary disturbance and pain. Its diagnosis was based on careful urethrocystoscopic examination.

A new classification is suggested and methods of treatment based on the duration and severity of the disorder are recommended. JOHN A. LOEF, M.D.

Tremblay, R. G., Crane, A. R., and Harris, A.: Primary Osteogenic Sarcoma of Bladder. *J. Urol.*, Balt., 1944, 51: 143.

A sixty-nine-year-old white male was admitted to the hospital complaining of hematuria and dysuria. The hematuria began six months before admission, subsided for a period of three months, and then occurred at intervals and was finally accompanied with dysuria.

The past history and family history were entirely noncontributory.

The physical examination yielded no abnormal findings except as follows: blood pressure, 170 systolic and 80 diastolic; palpable enlargement of the prostate; and rales in the bases of both lungs.

On cystoscopy the day after admission, obstruction to the passage of the instrument was encountered in the region of the vesical neck. After further manipulation, the instrument deviated to the right when it finally entered the bladder with a definite "grating sensation" as if a calculus were causing the obstruction. A large irregular mass of grayish-yellow color was seen to the left of the midline and overlying the floor of the bladder. This mass was movable. Prostatic hypertrophy was also demonstrated. The appearance of the mass was that of a large calculus and in no way suggested viable neoplastic tissue. The diagnosis at this time was, therefore, stone in the bladder with benign prostatic hypertrophy.

Cystotomy performed the following day revealed a large, uneven, somewhat lobular, very hard, oval-shaped tumor about the size of an orange, and attached by a pedicle stalk approximately 5.0 cm. wide in the region of the left ureteral orifice. The tumor was so hard that it required removal piecemeal by cutting dissection. The basal attachment apparently involved the submucosal and muscular layers of the bladder wall. This area was extensively and deeply fulgurated with the coagulating current.

Ten days later, prostatectomy was performed. Convalescence was uneventful after this operation. Eighteen days later, cystoscopy was done. On the lateral wall posteriorly, there was a rounded elevated smooth mass about 2.5 cm. in diameter which appeared typical of neoplasm. Two or three smaller patches were also seen immediately behind the first mass. The left ureteral orifice was not visible.

The laboratory findings were: red blood cells, 4.1; with 70 per cent hemoglobin falling gradually to 43 per cent in the fourth week. The fixed specific gravity of the urine was 1.013–1.016. Urea clearance showed 19 per cent function. Urea nitrogen, 20 mg.; calcium, 11.4; phosphorus, 2.9; total protein, 5.9; serum alkaline phosphates, from 1.3 to 5.9 Bodansky units.

Roentgenographs of the chest and entire skeleton were negative for tumor metastases.

The patient was discharged from the hospital six weeks after admission to report regularly at the clinic.

Eleven days later, however, he returned to the hospital for relief of pain associated with acute right epididymitis. He also suffered from frequency and dysuria.

About eight weeks after admission, cystoscopy showed the entire left hemisphere of the bladder to be involved with an irregular infiltrating tumor recurrence. Several pieces of tissue were removed with biopsy forceps. This confirmed the finding of osteogenic sarcoma with evidence of a very rapidly growing tumor.

The opaque cystogram showed an extensive filling-defect of the left hemisphere of the bladder. Two subsequent cystograms at intervals revealed a rapid and progressive obliteration of the bladder cavity by the malignant masses.

The urea nitrogen rose from 35 to 80 mgm. and the creatinine from 3.2 to 5.3 mgm. The serum-acid phosphatase was constantly at a level of from 0.5 to 0.6 units, while the alkaline phosphatase which was 6.0 units (Bodansky) at the time of readmission rose to 8.0 units at the time of the patient's death.

The autopsy showed the following positive findings. Two subcutaneous nodules about 5.5 cm. in diameter were present in the suprapubic scar, and between these was a sinus 0.3 cm. in diameter connecting with the bladder. The skin over these was tense, bluish, and atrophic. The peritoneal cavity contained a large mass 18.0 by 10.0 cm. continuous with the bladder and the skin nodules. The pleural surfaces of the lungs showed multiple white tumor nodules from 0.5 to 2.0 cm. in diameter. The left lung weighed 325 gm. and the right, 450 gm. Each showed multiple pleural and parenchymal, circumscribed, hard, white tumor nodules from 0.5 to 2.0 cm. in diameter.

The left kidney weighed 80 gm. and the right, 150 gm. Each showed a marked dilatation of the ureter and pelvis and contained a yellow purulent material. The surfaces were irregularly granular and showed flat depressed scars and small yellow abscess areas from 0.1 to 0.2 cm. in diameter. The pyramids were indistinct on section. The bladder measured about

12.0 cm. in diameter and was entirely filled by a gray-green cauliflowerlike growth rising from a broad base and covering most of the posterior and superior bladder walls. On section, the mass was hard, gritty, firm, and white. The posterior bladder wall was thickened to measure 3.0 cm. and was also firm, white, and gritty. The ureters opened directly into the tumor mass and were markedly constricted by it.

Multiple sections of all portions of the tumor were identical histologically to the original tumor, the recurrences, the tumor at autopsy, the skin nodules, and the various metastases. They showed irregular anastomosing bands of osteoclastic giant cells, and groups of cartilage cells were also present. Mitoses were numerous, and the tumor could be seen invading capillaries at many points. A crystal violet stain for amyloid was negative. Mallory's aniline blue and phosphotungstic-acid hematoxylin stains were negative for intracellular fibrils. Weigert's stain for elastic tissue showed none within the tumor A fat stain showed droplets within macrophages and some of the cartilage cells. Stains for acid phosphatase were negative, but stains for alkaline phosphatase made after the modification of Kabat and Furth showed abundant phosphatase in the more cellular portions of all the tumor tissue.

The anatomical diagnoses were osteogenic sarcoma of the bladder with metastases to the abdominal wall, pelvic cavity, lungs, and intestinal serosa; chronic cystitis; chronic pyelonephritis; bilateral pyonephrosis and pyoureter; and vesical sinus.

JOHN A. LOEF, M.D.

Rathbun, N. P., and Wehrbein, H. L.: Lymphosarcoma of the Urinary Bladder. *J. Urol.*, Balt., 1944, 51: 31.

The authors review 5 previously reported cases of lymphosarcoma of the urinary bladder, and report a sixth case, their own, which occurred in a sixty-four-year-old female with a ten-year history of recurrent cystitis associated with marked frequency, but no hematuria. Cystoscopy showed 2 round, smooth, white, sessile tumors in the region of the right ureteral orifice and 2 smaller similar tumors above the left ureteral orifice. At operation, two 2.5-cm. tumors near the right ureteral orifice, and 3 pea-sized tumors above the left ureteral orifice were removed with a loop and the bases were fulgurated with the coagulating current. Recovery was uneventful. Postoperative roentgen-ray treatment through 5 portals totaled 4,100 roentgens. Six months later cystoscopy showed no recurrence.

The specimens removed at operation consisted grossly of firm, white, elastic, rubberlike tissue. They were sharply defined, covered with mucosa, and did not infiltrate the muscularis. Histologically, the tumors showed the general picture of lymphoid tissue consisting of active areas of lymphopoiesis and ill-defined islands of lymphopoietic tissue. The predominant cell type was the small lymphocyte. Mitotic figures were numerous in the germinal centers. The tumors did not infiltrate the muscularis, but there was some inflammatory infiltration in the muscularis. The histological diagnosis was lymphosarcoma of the urinary bladder.

The rarity of this disease is due to the fact that the normal bladder lacks lymphoid tissue. Prolonged irritation through infection is required before lymphoid tissue appears in the submucosa. One or two attacks of cystitis are not sufficient; a recurrent or chronic cystitis of long duration is necessary to produce the development of lymph follicles which grossly appear as rice-grain-sized white bodies usually situated on the trigone, although they may be present all over the bladder. It is of great significance that in all reported cases of lymphosarcoma of the bladder, cystitis has been present for some time preceding the apparent development of lymphosarcoma (from seven months to twenty-five years).

Of the 6 cases thus far reported, 3 were quite malignant, death having occurred in from one week to eight months after the diagnosis was made. On the other hand, the remaining 3 cases have been considerably less malignant, no recurrence having been found at six, eight and twenty months following resection and x-radiation (2 of the 3 cases received x-ray therapy).

The authors present photomicrographs of exceptional clarity, showing to advantage the appearance of the lymphosarcomatous tumors and of lymph follicles in the submucosa of chronically inflamed bladders examined postmortem.

DONALD F. MCDONALD, M.D.

GENITAL ORGANS

Huggins, C., and Bear, R. S.: The Course of the Prostatic Ducts and the Anatomy, Chemical Analysis, and X-ray Diffraction of Prostatic Calculi. *J. Urol.*, Balt., 1944, 51: 37.

Four types of calcification phenomena occur in the prostate, namely, (1) true or endogenous calculi, in the substance of the gland, derived from the prostatic secretion; (2) false or exogenous calculi, stones lodged in the urethra derived from urine; (3) stones in diverticula of the prostatic urethra, derived both from prostatic secretion and urine calculi which presumably become covered with layers of urinary salts, and (4) bone. In the literature most analyses of true prostatic calculi have been only qualitative.

Prostatic calculi are common at all ages over twenty years, increase in number with age, vary in size from microscopic to pea size and may even reach 1 cm. in diameter. Corpora amylacea occur in the prostates of monkey and man but do not occur in dogs. Prostatic calculi are found in any part of the gland, but when adenomatous hypertrophy is present the calculi are almost invariably found outside of the adenomas in the layers of fibrous tissue encapsulating the adenomatous lobe.

Nine prostates containing true calculi were examined histologically and six groups of calculi therefrom were subjected to chemical analysis and x-ray dif-

fraction. One prostate was cancerous, 6 were adenomatous, and 2 were removed for calculus disease. Roentgenographs taken of slices of the prostates removed for calculus disease demonstrated that the calculi were located posteriorly and peripherally. Microscopic sections revealed that the larger calculi were in the ducts and that the acini contained merely microscopic stones. From the roentgenographs, the course of the stone-filled ducts is shown. The ducts from the lateral lobes run posteriorly between them and the posterior lobe to approach the midline in a crescentic course and empty chiefly laterally to the verumontanum, but also through its convex surface and into the utriculus seminalis. Prostatic calculi lying within adenomas, found in but 2 of 50 adenomatous prostates examined, were only of microscopic size. The stones were found to lie within ducts, some of which were cystically dilated. Occasionally, stones were found within the fibromuscular prostatic stroma, probably having sloughed through acinar epithelium. Interstitial stones may call forth no inflammatory reaction, but on the other hand, they may be dissolved by leucocytes within the ducts.

The chemical analyses of 6 groups of calculi gave nearly similar results: namely, combustible material, from 18.9 to 22.2 per cent; protein, from 7.56 to 8.80 per cent; carbon dioxide, from 1.06 to 2.64 gm. per cent; citric acid, from 0.17 to 2.89 per cent; and cholesterol, from 3.78 to 10.6 per cent (dry weight); magnesium was present in small amounts but oxalate and sulfate were not detected. The chief constituents of the calculi were calcium and phosphorus, which occurred in the ratio of from 1.22 to 1.47 to 1 for untreated dried stones, and from 1.24 to 1.38 to 1 for ashed stones. The ratio for tribasic calcium phosphate is 1.5. In bone it is 1.47 to 1.

X-ray diffraction patterns of powdered prostatic calculi, dried calf rib, and chemically pure tribasic calcium phosphate revealed essentially similar principal spacings.

It is concluded that the chief constituents of both prostatic calculi and bone have the crystalline structure of tribasic calcium phosphate, presumably with an apatite constitution.

DONALD F. MCDONALD, M.D.

Nesbit, R. M., and Cummings, R. H.: Prostatic Carcinoma Treated by Orchectomy. *J. Am. M. Ass.*, 1944, 124: 80.

A second follow-up study conducted on a series of patients treated by orchectomy for prostatic cancer gives further evidence of the value of the treatment.

Forty-five per cent of the patients remain free from symptoms from twenty-one to thirty-six months after orchectomy, but 21 patients previously reported as showing favorable response have had recurrent symptoms of advanced disease and several of these are dead. The increasing incidence of delayed failure in this series suggests that eventually all cases may fall into this category.

It is evident that endocrine therapy increases the life expectancy of patients with prostatic cancer by causing a suppression of carcinogenic activity for temporary but varying periods of time; and this temporary control of the neoplasm is accompanied clinically by a period of relief from the symptoms resulting from the malignant disease.

It would seem logical to conclude that the maximum benefit to the patient may be derived by delay of the endocrine treatment until the onset of symptoms arising from advanced or metastatic lesions. Only in this manner can the longest period of palliative relief be assured. JOHN A. LOEF, M.D.

Madrid, A.: Tumors of the Testicles (Tumores del testiculo). *Rev. urol.*, 1943, 1: 149.

From the histological point of view tumors of the testicles may be classified as follows: (1) seminomas, (2) malignant teratomas which may contain portions of a typical teratoid tumor, and (3) malignant tumors which may be subdivided into (a) adult teratomas, (b) tumors with interstitial cells, and (3) adenocarcinomas.

Due to their insidious onset, tumors of the testicles may remain unrecognized for a long time. Pain is usually the first sign. The tumors may acquire an inflammatory form, simulating an acute orchitis. They may also produce a symptomatic hydrocele. Metastatic lymph glands on the neck or in the axilla may be the first sign of a testicular tumor. Occasionally a fulminating form with a rapid extension of the tumor and generalized metastases may be observed.

Among 17 cases observed by the author, the Aschheim-Zondek reaction was positive in 7, and the Friedman reaction in 4.

The majority of tumors of the testicles are malignant, seminomas and teratomas forming the bulk of such cases. All of them secrete a gonadotropic hormone which appears in the urine.

Metastases usually appear from four months to two years after the first signs of the primary tumor and are usually found in the lungs, pleura, liver, kidneys, spleen, or brains.

If the gonadotropic hormone disappears within two weeks after castration and the histological examination indicates radiosensitivity, the prognosis is good; however, if the microscopic examination indicates radioresistance the prognosis is doubtful. If the gonadotropic hormone is still found in the urine two weeks after castration, irradiation is indicated. If under the influence of the treatment the hormone disappears or its amount diminishes, the prognosis should be guarded, while absence of modification in the amount of hormone denotes a bad prognosis. In the last mentioned type of case surgical treatment is indicated. Surgery should be employed also when the gonadotropic hormone disappears from the urine after castration but the histological examination shows the tissues to be radioresistant.

If clinically detectable metastases are present and the patient is in a good condition, the prognosis is relatively good if the metastases disappear and the

amount of excreted hormone diminishes under irradiation. A bad prognosis is offered by radioresistant metastases. JOSEPH K. NARAT, M.D.

MISCELLANEOUS

Combes, F. C., and Canizares, O.: The Experimental Prophylaxis of Chancroid. *Am. J. Syph.*, 1944, 28: 59.

In order to ascertain the prophylactic value of locally applied sulfonamide for chancroid the following study was made. Autoinoculated patients were observed. The diagnosis of the autoinoculated ulcer was made by isolating Ducrey's bacillus culturally. Anna Pappenheim's stain was used, and usually the smear on the fifth day following inoculation was found to be satisfactory.

The autoinoculations were done on the external aspect of the arm and only such lesions as demonstrated Ducrey's bacillus were used as a source of inoculum. The multiple puncture method was used for inoculation and from 2 to 4 autoinoculations were made on each arm. The incubation period varied from two to four days. A control was left on each arm, while the prophylactic ointments were rubbed in for two minutes and the excess left *in situ* and covered with a sterile dressing. Most often the period between inoculation and application of the prophylactic was one hour.

The means of prophylaxis was soap and water and mercurial ointments, both of which were found ineffectual in preventing the appearance of autoinoculated chancroids. Sulfathiazole ointment of 10 per cent concentration was effective in 80 per cent of the lesions treated, while lesser concentrations of sulfathiazole and mixtures with mercurials were found to be of diminishing prophylactic value.

ROBERT LICH, JR., M.D.

McKenna, C. M., Bronstein, I. P., and Kiefer, J. H.: Hypergenitalism in Childhood. *J. Urol.*, Balt., 1944, 51: 182.

There seems to be some question that the pineal body is responsible in sexual precocity, and the authors point out that there are some 18 cases reported, including 1 of their own, in which the hypothalamus and third ventricle were involved and the pineal body was found unaffected. It is stated that large slow-growing tumors in the hypothalamus need not produce symptoms which are referable to the cerebrum.

Two cases are reported; one was of three years' duration and the other was seen from nine and one-half to thirteen years and nine months after it had developed. The first case failed to demonstrate definite etiological factors and the authors observed the patient and reserved therapy on future indications. The second case was treated with 100,000 units of follicular hormone over a period of ten weeks after it was noted that the exhibition of 60,000 international units of estrogen and a small amount of deep irradiation therapy to the pituitary gland was of no therapeutic value. The follicular hormone therapy caused a diminution of the penile erections with their final disappearance, and the patient's acne became more marked. The effects of this treatment were satisfactory for more than two years. Closure of the patient's epiphyses was found at the age of thirteen years and nine months, and the authors make the suggestion that the therapy may have been a contributory factor.

It was observed that female sex hormones in hypergenitalism in the male produce the following: (1) disappearance of sexual phenomena, (2) inhibition of the gradient of growth, and (3) a quantitative reduction of the androgenic gonadotropic substance.

The accompanying photograph is that of the three-year-old patient with hypergenitalism.

ROBERT LICH, JR., M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Key, J. A.: Sulfonamides in the Treatment of Chronic Osteomyelitis. *J. Bone Surg.*, 1944, 26: 63.

The author reviews the results in 101 cases of chronic pyogenic infection of bone in which, after excision of the infected soft tissue and bone, the wound was dusted with sulfathiazole powder, closed in layers whenever possible, and immobilized in a plaster case.

From 2 to 5 gm. of sulfathiazole were placed in the wound and this drug was also given orally in doses of 1 gm. every four to six hours on the day before operation or earlier. Toxic reactions occurred in a total of 6 patients and included the suppression of urine in 1, hematuria in 1, and skin reactions in 4. Sixty of the wounds, 11 of which were amputations, healed by primary intention, but in 4 which contained metal, sinuses developed later and the metal had to be removed.

The author concludes that the use of chemotherapy has considerably increased the safety of surgical procedures and permits primary closure of a large percentage of wounds after surgery for chronic osteomyelitis. However, he also believes that each case is an individual surgical problem.

In the author's opinion the method of excision and primary closure with chemotherapy is superior to the Orr method in that it results in less unpleasantness and less danger, and enables the surgeon to swing flaps, cover bones, and eliminate large areas of scarring in the treatment of chronic osteomyelitis.

In a discussion of this article ORR pointed out that in the closed method voluminous sterile dressings prevent secondary infection and odor. In Orr's opinion a large percentage of wounds cannot be closed primarily without risk.

DANIEL H. LEVINTHAL, M.D.

Haggart, G. E., and Carr, C. R.: Chronic Adhesive Subacromial Bursitis. *N. England J. M.*, 1943, 229: 987.

The author reviews the literature on chronic adhesive subacromial bursitis and related conditions, and describes the principal anatomical and pathological features.

The patient with chronic adhesive subacromial bursitis complains of pain in the shoulder, which often extends up into the neck as well as down the extremity to the hand. There is marked limitation of motion in the shoulder joint and, according to the duration of symptoms, there is atrophy of the musculature. Some patients also have swelling of the hand and fingers and some loss of finger function.

The treatment requires from three to sixteen months, according to the extent and duration of the involvement and the co-operation of the patient. All patients require adequate and well directed physical therapy with persistent treatment at home following the initial hospital or office treatment.

The patient is admitted to the hospital and the arm is suspended in a Balkan frame with the maximum abduction that does not cause increased discomfort, and from 6 to 8 lb. of traction are applied to the arm. Local heat, massage, and gentle movement are encouraged. After from three to ten days a shoulder manipulation is carried out under pentothal sodium in the patient's room with the arm in the apparatus. No attempt is made to obtain normal range of motion in the first manipulative procedure. After the manipulation 1 per cent novocain is injected into the bursa and the periarticular structures.

Active exercises are started after twenty-four hours. When the pain abates the patient becomes ambulatory and begins pendulum exercises.

If there is calcification within the bursa, the manipulation is done, needles are passed into the bursa (Patterson, Smith-Petersen), and an attempt is made to wash out the calcific material.

Open operation is performed when the adhesions are very resistant and fracture of the humerus may result from manipulation. The bursa is explored and adhesions are divided. Then the manipulation is performed.

When there is a large mass of calcification which cannot be removed by needling, operative treatment is indicated.

In the author's series 47 per cent of the patients were completely relieved, 34 per cent were benefited markedly, 5 per cent were moderately benefited, 5 per cent were not benefited, and 9 per cent were benefited on discharge, but the follow-up was inadequate.

DANIEL H. LEVINTHAL, M.D.

Elliott, F. A.: Tender Muscles in Sciatica: Electromyographic Studies. *Lancet*, Lond., 1944, 246: 47.

The author presents 8 cases of sciatica in which a prolapsed invertebral disc was found at operation and in which areas of local tenderness were found in various extensor muscles. Six similar cases of sciatica with prolapsed discs but with no areas of tenderness were used as controls.

Electromyographic studies of the areas of deep muscle tenderness showed increased irritability and sustained muscle activity even at rest. Procaine injected into these areas resulted in subsidence of the electromyographic discharge and cessation of the tenderness.

The author suggests that this electromyographic activity represents involuntary spasm of small groups of muscle fibers. The spasm is thought to be the source of the tenderness.

Similar electromyographic activity has been found in "fibrositis" of the shoulder girdle, and in the ex-

tensor muscles of the arm and forearm in brachial neuritis, both with and without root signs. Muscle spasm is considered to play a part in rheumatic myalgias and in the less common root syndromes.

DANIEL H. LEVINTHAL, M.D.

Huddleston, O. L.: Recent Experimental Studies on the Effects of Immobilization of Denervated Muscles. *South. M. J.*, 1944, 37: 72.

The author denervated the distal muscles in the right hind limbs of dogs by crushing the anterior nerve roots of L_5, L_6, L_7, and S_1. The left hind limb served as a control. The muscles studied were the anterior tibial and the gastrocnemius-plantaris.

The animals in which limbs were immobilized were divided into three groups: one with the limb in full extension, one with the limb in a semiflexed neutral position, and one with the knee in extension and the ankle in acute flexion. The following tests were conducted: (1) muscle-weight tests, (2) tension-myogram tests, and (3) electrical tests similar to the reaction of degeneration determinations. The results obtained in the operated immobilized dogs were compared to results obtained in a second series of operated non-immobilized dogs and a third series of unoperated dogs whose limbs were placed in casts.

As shown in the table accompanying the article results indicated that: (1) lack of immobilization of denervated muscles did not interfere with regeneration of the motor nerve supply; (2) regeneration of the motor-nerve supply was more complete when no immobilization was applied; (3) immobilization seemed to interfere with reinnervation of the denervated muscles; and (4) immobilization in the position of maximal muscle length gave less functional recovery than immobilization in the position of minimal muscle length.

DANIEL H. LEVINTHAL, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Cottrell, J. C.: Conservative Treatment of Chronic Bursitis. *J. Am. M. Ass.*, 1944, 124: 81.

Of 50 patients with various pathological types of bursitis, reported on by the author, 27 with chronic effusion were treated by the injection of sclerotic agents combined with continuous drainage. Fifteen of the cases treated were examples of olecranon bursitis and 11 of prepatellar bursitis, and there was 1 case of popliteal bursitis.

The technique employed was as follows:

After cleansing of the skin and infiltration with 2 per cent procaine hydrochloride, the sac was exposed by a ½ cm. transverse incision, and a specially designed hollow-tubed spool-shaped, soft rubber drain was inserted. After the effusion had been drained, from 2 to 5 cc. of one of the following sclerotic agents (sodium morrhuate, 5 to 10 per cent; tincture of iodine, 0.5 per cent; proliferol solution, and sodium psylliate, 5 per cent) were introduced into the cavity by means of a glass-tipped syringe, and allowed to

Fig. 1.

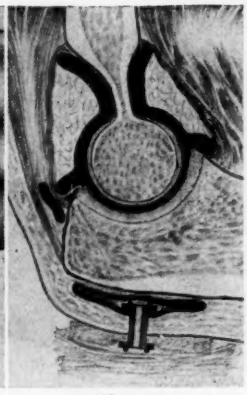


Fig. 2.

Fig. 1. Incision through procaine-hydrochloride-infiltrated skin over olecranon bursa. Folded rubber bursal drain ready for insertion into bursal sac.

Fig. 2. Drain in position in irritated sac; sponge rubber and gauze compressive dressing applied.

remain for from five to ten minutes before they were drained off. A rubber-sponge pad with a fluff dressing was held in position over the bursal sac by means of an elastic adhesive dressing, which was changed in twenty-four hours. The drain itself was removed in from forty-eight to ninety-six hours, and the compressive dressing was continued.

After from five to seven days re-examination demonstrated successful obliteration of the sac, and recurrence of the effusion was rarely observed.

Of the 15 patients with chronic olecranon bursitis, 14 have been apparently cured, and of the 11 with prepatellar bursitis, 10 are reported as having been cured. The patient with popliteal bursitis has completely recovered. No infection has resulted in any instance.

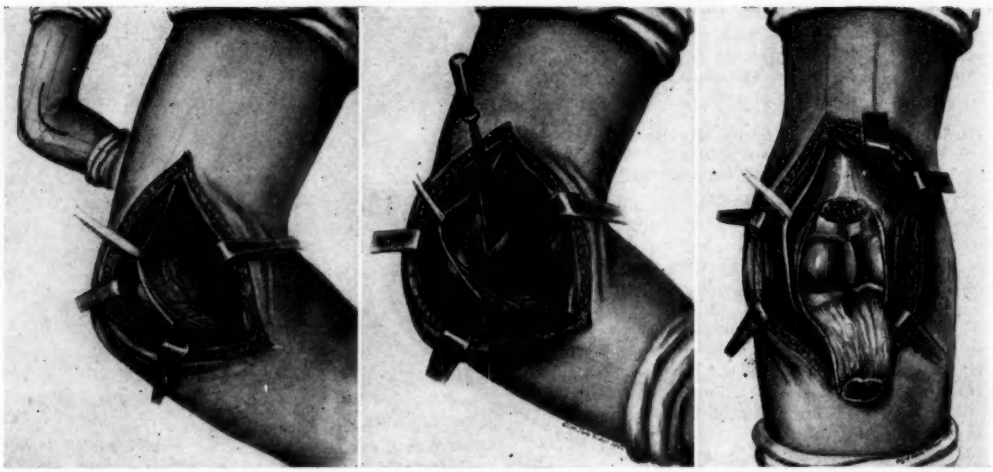
This form of treatment entails very little after-treatment and a minimum loss of time.

RUDOLPH S. REICH, M.D.

Wilson, P. D.: Capsulectomy for the Relief of Flexion Contractures of the Elbow Following Fracture. *J. Bone Surg.*, 1944, 26: 71.

Limitation of extension of the elbow is a not uncommon sequel of fractures in that region. The degree of the limitation varies considerably. Slight limitation, that is, less than 30 degrees, is not an appreciable handicap; and many adults, who have this amount of restriction of movement following fractures sustained in childhood, are scarcely conscious of anything wrong with their arms. The term flexion contracture is generally reserved to describe limitation of motion more serious than this, and it is to cases with extension limited at 120 degrees or less that this article applies.

If we may exclude the type of contracture caused by superficial scars, such as follows burns or lacera-



a b c

Fig. 1. a, Showing the anterior approach to the elbow, the incision passing down between the brachioradialis and the brachialis, with exposure and retraction of the radial nerve. b, Showing exposure of the lower end of the humerus by subperiosteal stripping, followed by chiselling away of the bony irregularity on the outer surface of the humerus just above the capsular attachment. c, The bony fragment, scar tissue, and anterior capsule have been stripped downward preliminary to excision of these tissues.

tions of the soft parts, flexion contractures of the elbow resulting from fractures in that region may be due to one of the following conditions:

1. Irregularity or distortion of the joint surfaces, with loss of cartilage or with fibrous adhesion
2. Malunited fractures with bony projections or excessive callus forming a bony obstacle which impinges against the other member of the joint and impedes motion
3. Fibrous thickening and contracture of the capsular ligament, with loss of extensibility.

It is to emphasize the importance of this last factor as a cause of restricted motion of the elbow that this article is written.

There are, of course, many lesions of the elbow or adjacent soft structures, other than fractures, that may cause limitation of elbow motion. These include tuberculous, infectious, or rheumatoid arthritis, tumors, and various types of neurogenic contracture. The treatment of these conditions is well understood. The scope of this article is restricted to flexion contractures resulting from fractures.

It is necessary to emphasize that limitation of extension of the elbow should not be designated as a flexion contracture until sufficient time has passed following the fracture to obtain restoration of function. It is well known that recovery of motion following a fracture or dislocation of the elbow is often slow, and that gradual improvement is to be expected over many months. During these early months, when an anxious parent is complaining that the child's elbow is crooked and not getting better, the surgeon must calm these fears and counsel patience. Nothing but harm is done by forcible manipulation either with or without an anesthetic. Physical therapy is rarely indicated in fractures of childhood, and is of only limited usefulness in those of adults. Active use of the arm within the limits of pain is the best remedy and a surgeon can usually accomplish more by encouraging the patient and counselling patience than by any other means. Skillfully supervised occupational therapy may be of considerable therapeutic assistance. Generally the greater part of motion is recovered within six months, but a further gain of from 10 to 15 degrees during the next six months is frequently observed. One is generally safe in assuming that functional recovery is complete at the end of one year, and that whatever limitation of motion is present at that time will be permanent.

Every case presenting limitation of motion following fracture of the elbow must be judged on its individual merits, and an attempt made to analyze the cause of the restriction of motion on the basis of the clinical examination and the roentgenographic evidence. Much may be learned by palpation and identification of the various bony prominences, and by ascertaining their relationship to each other. Also valuable information may be obtained by careful and repeated trials of the movement in an endeavor to determine whether it is limited abruptly, as by a bony obstacle, or whether the stoppage is of the less sudden and more elastic type characteristic of a contracted capsular ligament. When the limitation is present in both flexion and extension, it is generally a sign of intra-articular damage, and of in-

volvement of one of the cartilaginous surfaces of the joint. Limitation of pronation and supination is also a sign of intra-articular damage, and generally means a malunited fracture of the head or neck of the radius.

The evidence obtained from roentgenographic examination is of great importance and the roentgenograms should be studied carefully. Narrowing of the joint cartilage space, or irregularity and distortion of one of the articular surfaces points to intra-articular involvement as the cause of the limited motion. Bony irregularities and projections near the joint surfaces may mean a bone block to movement. The part that such bony obstacles play in impeding movement may be elucidated further from roentgenograms made with the elbow in complete extension and complete flexion, or from stereoscopic roentgenograms. It is from an understanding of the pathological changes which have taken place that the surgeon may make a diagnosis of the cause of the limitation of movement and determine what, if any, operative procedure may be undertaken.

Fibrous thickening of the anterior capsule may play a considerable part in limitation of elbow extension, and the condition may be overcome by excision of the fibrotic portion of the capsular ligament. While the cases in which such procedures may be required are rare, the author has accumulated 5 in a period of eleven years, and believes that it may be worth while to report his experience in the hope that it may be of help to other surgeons.

The operation has generally been performed under a tourniquet through an anterior incision passing between the brachioradialis and the brachialis. This incision gives good visualization of the contracted capsule, and, at the same time, allows identification and freeing of the radial nerve. It has the disadvantage of crossing the flexion creases of the skin at the anterior surface of the elbow, and in children tends to give rise to keloid formation. In the last operation which was done, a medial incision was used, the muscles being stripped subperiosteally from the anterior surface of the humerus. This gave adequate exposure of the anterior capsule, without the disadvantage of cutting the anterior skin creases. When another patient requiring this operation is encountered, the medial incision will be used.

The record of complicating nerve palsies following operation has been bad, as palsies have occurred in 4 of 5 cases. In 2 of the patients, the palsy was caused by stretching the radial nerve, which had become contracted because of the long-continued position of flexion; in the other 2 cases, it was probably the result of pressure from the tourniquet. As desirable as a bloodless field may be for this type of operation, it is not worth the risk of this complication, and it would be better to discard the use of the tourniquet. Complete spontaneous recovery of all these palsies was obtained within a period of four months, so that no permanent residual damage resulted from any of the operations.

ROBERT T. MCELVENNY, M.D

FRACTURES AND DISLOCATIONS

Finn, H. G., and Palmberg, K. J.: Fractures of the Carpal Scaphoid; A Study of 10 Cases. *Naval Med. Bull.*, 1944, 42: 38.

The authors believe that the incidence of fracture of the carpal scaphoid is apparently higher in military than in civilian life, this type of fracture greatly outnumbering Colles' fracture in their hospital and in the navy service. One contributing factor is that of age and another is that of sex. Fractures of the scaphoid bone are frequently overlooked. The diagnosis of sprained wrist should never be made until x-ray evidence has ruled out the possibility of fracture of the scaphoid. By prompt recognition of the fracture and immediate treatment, patients may be returned to their duties with minimum partial disability, and ultimately restored to complete usefulness with normal wrist function. The authors usually leave the cast in position for fully eight weeks, and believe that roentgenographic examination would readily indicate whether the period of immobilization should be extended. However, it is difficult to predict clinically, immediately after removal of the cast, whether a good result is to be anticipated. An apparently weak and painful wrist may recover normal function without immobilization within two weeks. To secure absolute immobility of the wrist joint the cast must be skintight, and no padding, whatever, should be used. If the plaster is applied very wet, with avoidance of pull, and the arch of the hand is carefully molded, one application of plaster will usually suffice for eight weeks. The plaster should be rather thick around the hand and thumb, and should extend almost to the elbow. The thumb must be strongly abducted and completely encased in plaster and the wrist extended in about 15 degrees of radial deviation. The fingers are left free to move. Regardless of the type of cast applied, the most important attribute of good treatment is immediate immobilization.

Regarding the treatment of ununited fractures, the authors believe that the x-ray appearance of the bone is important. If both fragments show normal bone structure, the wrist should be fixed in plaster for a period of two months or more. When marked opacity of the fragments appears on the roentgenogram, or there is other evidence of eburnation of bone in fractures more than six months old, the use of plaster casts is contraindicated.

From a perusal of the recent literature on old ununited scaphoid fractures, the authors draw the following conclusions:

1. The entire scaphoid should never be removed.
2. If the proximal portion of the scaphoid is comminuted, this portion should be removed entirely in order to prevent arthritis of the radiocarpal joint.
3. Drilling of the ununited fragments is less frequently advocated than formerly.
4. The accepted operative procedure at present consists of the insertion of an autogenous dowel graft into drill hole through both fragments.

5. The proximal fragment, if too small to warrant insertion of a bone graft, may be removed.

Ten cases are reported in detail.

EMIL C. ROBITSHEK, M.D.

Stuck, W. G.: The Treatment of Intertrochanteric Fractures of the Femur. *Surgery*, 1944, 15: 275.

Fractures in the region of the trochanters occur in older patients, and consequently are followed by a much higher death rate than fractures of the neck of the femur. Trochanteric fractures generally produce more pain and shock than the neck fractures. Also, trochanteric fractures are more varied in type and may range from simple cracks through the intertrochanteric region without displacement, to severely comminuted fractures with gross deformity.

The incidence, mortality, and classification of trochanteric fractures is given, and the types of treatment used are described and discussed in relation to the modern plan of treating these fractures.

The author believes that the present-day internal fixation of trochanteric fractures offers patients greater comfort, less disability, shorter hospitalization, and less likelihood of severe systemic complications from the enforced bed rest.

The more recently developed nails (Neufal's, Moore's, and Jewett's) have many superiorities over the others in that they pass across the fracture line, and, also, in that they are anchored to the shaft of the femur with screws. Their insertion is more difficult and a longer incision is required, but these disadvantages are outweighed by the nearly perfect fixation which can be secured.

EMIL C. ROBITSHEK, M.D.

Frankel, C. J.: The Kenny Treatment for Infantile Paralysis; a Year's Observation of 6 Cases. *Virginia M. Month.*, 1944, 21: 79.

Though his series of 6 cases is too small for the basis of scientific conclusions, the author believes that the Kenny method deserves further trial. If it offers the patients only greater comfort than previously accepted methods and does no harm, it is worth while. He could demonstrate no injury that could be attributed to the treatment. However, he cannot accept Sister Kenny's terminology or her explanation of mental alienation.

He firmly hopes that the opponents and proponents of the method will be allowed to settle their differences at medical meetings and in medical journals, unhindered by lay opinions in the lay press. A great deal of investigative work remains to be done and patients must be followed up for several years. There is as yet as little ground for overenthusiasm for the method as there is for total condemnation.

In his discussion, Funsten stated that the 6 cases treated do not represent a cross-section of the general run of cases of infantile paralysis. In an epidemic in Albermarle County several years ago 1,600 cases were counted but in that large number there was scarcely a 10 per cent incidence of paralysis, and some of the cases of paralysis were very mild.

This explains the success of the Kenny method of treatment to a great extent. She claims great cures for the treatment, whereas it is well known that many cases recover spontaneously without treatment. She also lays a great deal of emphasis on bulbar paralysis. It is known that children with this condition are very sick, but when they do not die they usually get well without any paralysis. That is one phase of the attitude toward the Kenny treatment.

About a year ago there were appointed two members from each of three orthopedic societies to evaluate the Kenny method of treatment. These doctors represented the American Orthopedic Association, the Orthopedic Section of the American Medical Association, and the American Academy of Orthopedic Surgeons. They have gone all over the country, visiting places where epidemics of poliomyelitis have occurred. They went to Chicago, to Minneapolis, to Winnipeg, Canada, to St. Louis, and to Dallas, observing the results of the Kenny treatment. Some were rather impressed and thought they saw something of value in it, particularly in the absence of contractures and because of the relatively early relief from pain.

The "pain" has been rather surprising to orthopedists, because it has never been an important factor in the disease. The pain almost invariably disappears with immobilization, and yet Sister Kenny calls attention to all these little suffering children who have this pain. It is true that most of them have pain when they are moved or when pressure is put upon the muscles involved.

Funston advised the elimination of the period of isolation in cases of poliomyelitis. There has been no series of cases in which there was any positive evidence of contagion during the early stages of the disease. Quarantine only means delaying the onset of the treatment for a period of three weeks, and this isolation is compulsory in a great many states. He believes it is entirely unnecessary, and quite a handicap to progress in the care of the disease. He believes that if the Kenny treatment has value (and he thinks it has some value) the first week or the first ten days after the onset of the disease is probably the time at which the hot packs and the rest of this treatment will do the greatest amount of good.

The experience in the Chicago hospitals, even with those patients who were sent out of the hospital at the end of the two-week or three-week isolation period without any evidence of poliomyelitis, or spasm (as Sister Kenny might call it), was that when some patients returned muscle spasm was present and it took from two to four months to get rid of it instead of the two weeks or three weeks which it took originally.

In closing the discussion Frankel said that the use of hot packs is not the most important part of the treatment. The most important part has not been emphasized. He believes the muscle re-education is the most important part; it is much more important than the application of fomentations under blankets. It takes a trained physical therapist to

apply the long series of procedures for muscle re-education that these cases require, although anyone can apply the hot packs. The treatment cannot be carried out in a small hospital unless it is especially equipped. Small hospitals may not have trained physical therapists.

From all available information, the author believes that the tendency of the disease to spread will be eliminated if the excreta are disposed of carefully. The excreta have been passed on to flies, the flies have been killed and ground up and fed to monkeys, and the monkeys have developed infantile paralysis. Therefore the excreta problem is the one that is going to have to be worked upon, rather than isolation of the individual case.

ROBERT P. MONTGOMERY, M.D.

Oppenheimer, A.: Pathology, Clinical Manifestations, and Treatment of Lesions of the Intervertebral Discs. *N. England J. M.*, 1944, 230: 95.

In many cases the symptoms of lesions of the intervertebral discs are transient or recurrent rather than persistent, and if a patient happens to be free of pain and discomfort he may develop symptoms in the future, or may have forgotten about symptoms that he had in the past. Disc lesions may give identical signs and symptoms as those caused by diseases of the viscera, muscles, bursas, peripheral joints, spinal cord, and peripheral nerves.

Among 100 patients complaining of symptoms suggestive of lesions of the cervical discs, flattening of the discs was demonstrable in 89 per cent. Among 35 of these, 11 showed evidence of bursitis, 5 of acromioclavicular arthritis, 2 of tuberculosis of the shoulder, and 17 of aortic sclerosis, coronary disease, and cardiac failure. In 8 of the remaining 11 cases, myalgia, polyneuritis, and subdeltoid bursitis were present in the absence of disc lesions. The source of complaint could not be ascertained in 3 cases.

From these observations it should be inferred that the roentgenographic demonstration of a diseased disc does not prove the discogenic origin of the complaint. Figures indicate that in about two-thirds of the cases certain clinical manifestations are in all probability due to the disc lesions disclosed on roentgenograms.

Of patients with flattened lumbar and lumbosacral discs, 37 per cent complained of pain in the low back, 31 per cent of limited motion in this region, and 49 per cent of recurrent sciatic pain. No correlation could be established between any of the clinical signs and symptoms and the degree of disc thinning. The amount and size of osteophytes at the anterior margins of the vertebral bodies did not seem to determine the incidence, kind, and severity of the clinical manifestations. All things being equal, the signs and symptoms were the same in the patients with and those without osteophytes. Osteophytes at the posterior margins of the vertebral bodies seem to accentuate and maintain radicular nerve pain.

The author bases his opinion upon 826 cases of disc lesions observed during the last eight years and a control series of 200 persons without symptoms and another control series of 100 persons with complaints suggestive of disc lesions.

The pathological changes of common disc lesions have been classified into two main groups: (1) those caused by rupture and (2) those due to degeneration. Most of the complaints were referred to, and the lesions were located in, the most movable vertebral regions or, specifically, in the lower cervical and lower lumbar segments.

Marginal osteophytes (hypertrophic spondylitis) may be caused when the horizontal vertebral surfaces come into contact with one another during certain movements. This trauma recurs frequently and marginal overgrowths are formed which resemble exostoses commonly designated as osteoarthritis of the spine.

Osteoarthritis of the apophyseal joints (hypertrophic spondylitis) is caused by a gradual wearing off of the articular cartilages which are affixed to the facets. At the level of a thinned disk, the neural foramen becomes narrow. The most frequent sites of pressure on nerve roots are the lower cervical and lower lumbar segments, not only because disc thinning is commonest in these regions, but because the nerve roots are thicker and the foramens are not proportionately wider than in other vertebral sections.

Narrowing of neural foramens was present in 92 per cent of the cases of disc thinning in this series. Marginal osteophytes may be present at the level of a perfectly normal disc, especially as a result of a low-grade bone infection and osteoarthritis of the apophyseal joints may be produced by several factors.

Among a series of 200 apparently healthy persons not conscious of any symptoms, flattened discs were found in 22. Conversely, among 312 unselected cases of disc thinning, clinical signs and symptoms pointing to a lesion of the involved vertebral segments were present in 85 per cent. The incidence of radicular neuralgia was found to be 43 per cent higher in the presence than in the absence of these exostoses.

Bony impingement of articular processes was associated with persistent backache and with limitation of vertebral motion in all the cases. No case of bony impingement without definite clinical symptoms was encountered. Radicular pain was present in 69 per cent of these patients; in 89 per cent of the patients with discogenic involvement of the apophyseal joints (hypertrophic spondylarthritis) pain and diminished mobility of the involved vertebral region were noted and were often associated with tenderness on pressure.

Only 8 per cent of all patients with thinned discs, but without involvement of the apophyseal joints, were conscious of pain, discomfort, or stiffness of the involved parts of the spine. Lesions of the lumbar and lumbosacral discs cause low back pain and limitation of movements in about one-third of the cases. Pain and limited motion of the spine seemed to develop chiefly when the apophyseal joints have be-

come involved, irrespective of the location of the lesions.

Marginal osteophytes, no matter how large or numerous, do not cause symptoms unless they arise at the posterior vertebral edges and project into the neural foramen. The only influence that anterior vertebral osteophytes have is that they may limit anterior flexion of the spine when they are bulky, but the patients are rarely conscious of this limitation. Many patients who had complete obliteration of the intervertebral spaces were free of symptoms, but other patients with only moderate thinning of the discs, had severe radicular neuralgia. Pain and rigidity of the vertebral regions are caused in the majority of cases by the involvement of the apophyseal joints.

The clinical course of discogenic disease is divided into the early stage, moderately advanced stage, and the advanced stage. Weight, height, and general build did not seem to play significant parts. The patients were short, tall, stocky, and slender people with the same symptoms, but the symptoms seemed to appear at a younger age in stocky patients than in slender patients. Occupational and social factors could not be ascertained as contributing causes. In 74 per cent of the patients the discogenic symptoms were preceded by an infection such as sore throat, sinusitis, or cystopyelitis, and the complaint persisted after the infection had subsided.

Most of the clinical manifestations, however, are caused not by the disc lesion itself but by the secondary alterations in the neural foramens and apophyseal joints resulting from the constriction of the intervertebral space.

Pain in the back and limitation of the vertebral movements are less frequent and seem to be caused predominantly by involvement of the apophyseal joints by the condition of the disc.

RICHARD J. BENNETT, JR., M.D.

Ilfeld, F. W.: Pes Planus; Military Significance and Treatment with Simple Arch Support. *J. Am. M. Ass.*, 1944, 124: 281.

About one-third of the patients examined at a station hospital in California who had orthopedic complaints referable to the foot were given their medical discharge. Since December 7, 1941, a firmer attitude has been in effect. Only 2.6 per cent were discharged by the Certificate of Disability Board for pes planus during the year 1942. Foot complaints, however, continue to be a major military problem.

The findings in a group of 75 white soldiers who were admitted to the orthopedic service with foot complaints and subsequently discharged from the service were compared with similar findings obtained on examination of 347 white soldiers with no subjective symptoms. The majority of the men receiving discharges had a so-called third-degree pes planus. Seven men of the normal group also had third-degree pronation. It was suggested, therefore, that pronounced pronation may be present without symptoms. Of the 75 men discharged, 48 gave a history of previously using supports; 46 also had backache; and 54 had pains in the knees. A "Thomas heel" and "metatarsal bars" were usually unsatisfactory.

A simple and practical arch support has been made from a piece of leather. The leather is cut to the shape of the patient's foot, soaked for several hours in water, and then fastened on a stock plaster shape and allowed to dry. A pad of orthopedic felt is shaped to give support under the longitudinal arch, and the metatarsal arch if needed. The felt pad is fastened to the leather with glue. The size and shape of the felt pad can be adjusted. Approximately 200 or 300 pairs of these supports have been prescribed per month; they cost about 20 cents a pair. A proper fitting shoe is very important. Common aids in foot hygiene are suggested.

RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Cohen, S. M.: Traumatic Arterial Spasm. *Lancet*, Lond., 1944, 246: 1.

From a wide study of vascular injuries, many of them the result of war and bombing injuries, a number of theories and recommendations in the care of vascular injuries are made. The author contends that the peculiar response of the smooth muscle in the vessel accounts for the varying responses of arteries when they are subjected to direct trauma, contusions, or the nearby impact of explosive fragments. Smooth muscle responds to a stretch stimulus, and this, having been initiated, may keep up for many hours, or even days. Because of the fact that smooth muscle requires so little oxygen, it may keep up its contraction for a long time after other important tissues, striated muscle and nerve, have died. The spasm which may be so induced may be of such severity that the main arteries of the leg possess the appearance of strings.

The collateral circulation should ordinarily take care of the needs of the limb; it may not do so when the spasm induced in the main vessel extends into the collaterals, or when a large hematoma prevents the collateral vessels from performing their function.

The author believes that the role of the sympathetic system in the causation of arterial spasm has been definitely overemphasized, and that whatever action the sympathetic nervous system does effect acts primarily on the skin rather than on the deeper muscles. He believes that, through the lessening of the blood supply to the skin, more blood is available to the muscles which need it more. He does not, therefore, favor any action which will tend to warm up the skin and thereby favor dilatation of its vessels.

Arteriectomy is advised in the cases of severely contused and apparently thrombosed vessels, not for the purpose of relieving the so-called "reflex" spasm, but because such arteries are prone to develop secondary hemorrhage and traumatic aneurysm. Traction, which is necessary, as in operations on arteries, or accidental, as in dissection of the artery or through the connective tissue surrounding the artery, may cause spasm through the stretch reflex.

There are many special features of such vascular spasm. It is quite variable in duration; it may persist after the death of the limb; and it may be unaccompanied by pain. Generally it is not precipitated by venous thrombosis, and generally it will not be induced by the proper application of a tourniquet, but it may be induced by a tight, brutally applied tourniquet. Fractures are frequently followed by arterial spasm. This may be noted in fractures of nearly all the long bones. Gunshot wounds may initiate the spasm though the vessel is untouched. Exploratory operation is advised so that arteriectomy may be performed if the vessel is badly contused or thrombosed.

In the management of wounds with vascular spasm, several measures are of definite value. Normally, the limb should be kept cool in order that tissue metabolism may be kept at a minimum; it should be suspended so as to permit easy return of the blood; and, above all, shock should be treated promptly.

JOHN W. EPTON, M.D.

Learmonth, J. R., Blackwood, W., and Richards, R. L.: Localized Arterial Thrombosis of Indeterminate Origin. *Edinburgh M. J.*, 1944, 51: 1.

Four cases of localized arterial thrombosis in young adults are reported. These adults were healthy in every other respect, and showed no sign or symptom of cardiovascular disease other than that referable to the local condition. The clinical picture corresponded to that named by Leriche and Stricker, "spontaneous localized monoarteritis of indeterminate origin."

In the cases in which histological examination was possible, trauma seemed to be the most likely factor in the initiation of the thrombosis. Much light might be shed on the cause of these limited thromboses, by the recognition and investigation of the early stage of the condition by arteriography. In view of the latency of signs and symptoms until the thrombus is extensive, however, this possibility seems remote.

The clinical features have been referable to ischemia. Pain was of three types: (1) distal pain, in the peripheral part of the territory of the blocked vessel; (2) the pain of intermittent claudication; and (3) pain felt in areas superficial to the blocked segment of the artery. Nutritional lesions were present. Muscular wasting and failure to adjust the local temperature to that of the environment is to be expected in these cases.

An accurate diagnosis is reached by examination of the peripheral pulses, by noting the response to reflex vasodilatation, and by arteriography.

Treatment is by preganglionic sympathectomy or by arteriectomy.

SAMUEL KAHN, M.D.

Wetherell, F. S.: Treatment of Arterial Embolism of the Extremities—A Three-Phase Division. *N. York State J. M.*, 1944, 44: 35.

Once diagnosed, arterial embolism of the extremities demands immediate and uninterrupted treatment. This treatment is divided into three phases:

In the first phase, papaverine (½ to 2 gr. or 0.030 to 0.120 gm.) is given intramuscularly, and the dose is to be repeated in two or three hours (one-half dose if given intravenously). During this phase the patient is moved to a hospital and the site of embolic lodgment is established with the aid of the oscillometer. Occasionally the treatment with papaverine is

sufficient to establish a collateral circulation, as evidenced by increasing warmth of the affected part and return of the sense of touch and motion.

If improvement is questionable, the second phase is instituted by the use of heparin, dicoumarin, and "sympathetic ganglion block," by which is meant a procaine block of either the stellate ganglion or the lumbar paravertebral sympathetic ganglia. (About 10 cc. of 1 per cent procaine solution are injected into the twelfth thoracic, and first and second lumbar ganglia; the needles are left in place and after five minutes 5 cc. of 95 per cent alcohol is injected through each of the needles). Observation must be continuous until the circulation is definitely established. Unless there is incontrovertible and early evidence of return of the circulation, embolectomy is indicated.

The author uses local anesthesia without epinephrine for embolectomy. Other recommendations are as follows:

1. A continuous infusion of heparin is started shortly before operation. In this way it will aid in the prevention of thrombus formation during the suturing of the artery. A troublesome hematoma may result if the heparin is not given until after the wound is closed. Oozing can be seen and stopped when the heparin effect is present at the time of operation.

2. Injection of a few drops of 1 per cent procaine under the external coat of the artery, above and below the incision, acts much like a periarterial sympathectomy. Its use is recommended during and after the repair.

3. A method of hemostasis with minimal risk of damage to the intima is afforded by the use of a thin-bladed, rubber-covered clamp which can be closed to any desired pressure. Removable handles leave the operative field free.

4. After the clamps are applied above and below the embolus, the artery is incised and the thrombus removed. Interrupted sutures of arterial silk are placed about 2 mm. apart; then the clamp, which has been placed on the vessel proximal to the arterial incision, is loosened. As the distal clamp is still in place, one or more fine spurts of blood might be seen at this time issuing between the sutures. These bleeding points are noted and the lower clamp is removed. The drop in pressure on the wall of the vessel is now marked by a cessation of active spurting. Both clamps having been reapplied, supplementary sutures, fairly superficial, are placed at the points of spurting previously noted.

ERNEST E. ARNHEIM, M.D.

BLOOD; TRANSFUSION

Klein, A.: A Study of 3,000 Blood Transfusions. *Virginia M. Month.*, 1944, 71: 33.

This report is based on 4,166 units of blood drawn from donors and on more than 3,000 blood transfusions given within a period of fifteen months. Of this number, 2,164 were from white donors and 2,002 from negro donors. The percentage of type B bloods among negroes is double that in the white group. The incidence of positive serological tests for syphilis was 1.2 per cent in the white group and 14.7 per cent among the negroes. Five-hundred cubic centimeters of blood were drawn from each donor by a semiclosed system into 50 cc. of sterile 5 per cent sodium-citrate solution. The blood was stored at a temperature of 4° C. until it was used, or until it was seven days old; it was then prepared as plasma.

A total of 3,154 blood transfusions were performed within fifteen months. Of these, 1,800, or more than 55 per cent, were for surgical patients. Most of the blood was utilized within from two to three days. The erythrocytes were used for anemia after the plasma had been separated.

Reactions to transfusions are best classified according to the causative factors. These may be:

1. Nonspecific factors
2. Allergic factors
3. Definite incompatibility between the blood of the donor and the recipient.

Of the 3,154 transfusions, 205 produced chills or fever; there were 125 cases of chills and fever, 44 cases of chills without fever, and 35 instances of simple temperature elevation. There was no correlation of these reactions with the age of the blood or with the type of patient transfused. The only demonstrable causative factor for nonspecific reactions to blood transfusions in the group was variation in the technique of cleaning equipment.

Thirty-seven transfusions, or slightly more than 1 per cent of the total, were followed by symptoms of an allergic nature. In every instance the reaction was urticarial.

Hemolytic reactions attributable to incompatibility between the blood of the donor and the recipient have been rare in this series. Such reactions may be avoided in almost every instance by the use of high-titer typing serum, by routine direct cross-matching, and by testing for incompatibility due to the Rh factor in obstetric patients, and in patients receiving multiple transfusions.

LEROY J. KLEINSASSER, M.D.

Vaughan, J. M.: The Transfusion of Blood and Blood Derivatives under Emergency Conditions. *J. Am. M. Ass.*, 1943, 123: 1020.

The problems which arise in connection with the transfusion of war casualties differ to some extent from the problems of peacetime injuries. War casualties transfused are usually healthy persons who have suddenly had a knockout blow, while peacetime patients are sick people with disordered cardiovascular mechanisms. In addition, wartime transfusions are given under adverse conditions.

It is now widely held that any severely injured patient should be transfused, irrespective of his clinical condition and the level of his blood pressure, before being sent to the operating room. In fact, transfusion should be begun as soon as possible after injury, preferably at the site of the accident. Any

compound fracture, multiple fractures, severe lacerations of large areas of muscle, crush injuries, and second-degree burns of an area bigger than one hand should be regarded as severe injuries.

Experience has shown that serum and plasma are adequate for the immediate transfusion of all patients suffering from circulatory collapse after injury. In practice, it is usual to give one or more bottles of serum or plasma, followed by one or more bottles of stored blood, if this is available.

It has been found that anemia develops with remarkable frequency following injury. This is true especially in the case of burns. On theoretical grounds, it might be argued that fresh blood should be transfused in these cases, because sepsis is often present, and leucocytes, which may be of value, rapidly deteriorate in stored blood. For routine purposes, 420 cc. of blood are taken into an anticoagulant mixture consisting of 100 cc. of 3 per cent sodium citrate in distilled water, to which are added 20 cc. of 15 per cent dextrose in distilled water. For emergency use only group O blood is used.

In treating large numbers of severely injured patients, when speedy action is essential, derivatives have the advantage over blood in that they can be given without preliminary crossmatching. For this reason, it is usual to start treatment immediately with plasma or serum and, while this is being administered, crossmatching may be carried out.

From the clinical point of view, dry preparations are preferable to fluid preparations for the following reasons: (1) dried preparations are always sterile; (2) the concentration of protein given can be varied by altering the amount of diluent added; and (3) different diluents may be used for reconstituting the dried products—distilled water, dextrose, or saline solution.

For patients with circulatory collapse, apart from burns and crush injuries, derivatives are used in normal concentration. In burns, however, hemoconcentration is almost invariably present. The immediate need here is to replace fluid and reduce hemoconcentration. For this purpose, it is better to use derivatives than whole blood, which will add cells to the already concentrated circulating fluid. Proteins, as well as fluid, however, pass out into the burned areas and need replacement. It is, therefore, an advantage to give at least a twice concentrated derivative in such cases.

No hard and fast rules can be laid down for the dosage of blood and derivatives. Serial hemoglobin readings are of little value in the acute stage following simple trauma. In the case of burns and crush injuries, however, they are an essential guide to treatment. Such readings should be taken at least at two-hour intervals, and derivatives must be administered until the hemoglobin level is at or below 100 per cent (Haldane). There is little risk of overdosage, while many lives have undoubtedly been lost through underdosage.

For immediate transfusion, in healthy men, the rapid administration of at least a liter of fluid does not cause cardiac embarrassment. After the first twenty-four hours, all transfusions should be given at a slow drip rate.

The site of choice for transfusions is a small vein on the anterior aspect of the forearm. If both arms are injured, it is wise to cut down and insert a cannula into the internal saphenous vein. If no veins are available, fluid can be given by the sternal route.

SAMUEL KAHN, M.D.

Steiner, R. E.: Jaundice after Transfusion of Whole Blood or Human Plasma. *Brit. M. J.*, 1944, 1: 110.

In 5 cases of jaundice, studied by the author, it was found that the patients had all received transfusions and that some time later they had developed the jaundice. Similar occurrences have been recorded previously by other writers. The patients were battle casualties from North Africa, and had been admitted to the hospital from two to three months after having been wounded; they then developed jaundice. All of them had had transfusions of whole blood, human plasma, or both, in varying quantities. The treatment in every case was primarily some form of surgical intervention plus chemotherapeutic measures such as antitetanic and anti-gas-gangrene serum, and massive doses of the sulfonamide group of drugs.

After describing in detail the clinical condition of these patients, the author notes that the clinical picture in the 5 cases described resembled catarrhal jaundice or infective hepatitis in many ways. Generally speaking, it was a slightly febrile illness, with symptoms of nausea, anorexia, slight abdominal discomfort, vomiting, and signs of jaundice, liver enlargement, and tenderness in the right subcostal region. There were some symptoms that are not usually seen in catarrhal jaundice. In 3 of the cases there was a definite lack of free bile in the urine, with an excessive amount of urobilin. In some of the cases there was a marked mononucleosis.

The etiology of the illness described in these 5 cases is unknown, and it is impossible, in view of the lack of information concerning the incidence of jaundice among the untransfused troops in North Africa, to assess the statistical certainty of a connection between the transfusion and the illness. Nevertheless, the fact that of 245 patients from North Africa (of which approximately 45 per cent had transfusions), 5 developed jaundice, while not 1 of the untransfused patients developed it, suggests a connection between the two. Outbreaks of an illness resembling catarrhal jaundice following inoculation of groups of people with human plasma, serum, or lymph have previously been recorded.

The author concludes that some etiological significance must be attributed to (1) the temporal coincidence of the transfusions—within three weeks in 4 cases—as shown in the accompanying table; and (2) the fact that jaundice has been observed only in the casualties from North Africa and not in those from other theaters of war. It would therefore

appear that, while the transfusion may be the cause of the jaundice, certain special circumstances must be attendant on the transfusion before jaundice is produced. HERBERT F. THURSTON, M.D.

Edwards, F. R.: Despeciated Bovine Serum; Substitute for Human Plasma. *Brit. M. J.*, 1944, 1: 73.

The use of plasma in surgical treatment is increasing rapidly, and further studies of the condition of hypoalbuminemia and its relation to post-traumatic and postsuppuration cachectic states and to delayed wound healing envisage a still greater demand for plasma protein therapy. The groups of donors and blood banks organized throughout the country have hitherto provided a convenient supply of protein solution, but the investigation of an alternative source is indicated in view of the future need for this material.

The author notes that the substance most nearly approaching human plasma protein in character, and one which is available in quantity, is animal plasma protein. Unlimited quantities may be obtained in the form of animal serum. For total protein, bovine blood most nearly approaches human blood, but there is a much higher percentage of fibrinogen, which, however, is eliminated in the preparation of the serum. The infusion of animal sera of full protein content has up to the present been generally unsatisfactory, because of unfavorable reactions.

The author describes in detail the preparation of the despeciated bovine serum and states that it has been given a preliminary clinical trial in 26 cases. Two of the cases are described in detail.

This clinical trial of despeciated bovine serum would indicate that it is safe for administration to man and is unassociated with any severe form of reaction. No chills were observed, and serum sickness and delayed reactions were absent even after large quantities were given. A slight temperature increase was noted in some patients, but on no occasion above 100°F. No clinical evidence of intravascular hemolysis has been observed and no hemoglobinuria was seen.

The urine was tested in all cases for protein, and if this had been absent previously it was not found. No marked increase of protein occurred in those patients who had a preinfusion albuminuria. This would suggest that the protein does not pass through the renal capillaries, and no evidence was forthcoming that it passed out of any other capillaries in the body. It is reasonable to suggest that it is well retained in the circulation. The osmotic pressure effects are difficult to assess, but the result in the case of hypoproteinemia with edema suggests that this is considerable. When there was a large and rapid protein loss, such as in the acute empyema cases, the administration of despeciated bovine serum was marked by an immediate feeling of well-being on the part of the patient. Anaphylaxis so far has not been encountered, and has been deliberately tested for in 10 patients.

The solution is easily prepared, is available in enormous quantities, is completely stable, and can be stored at room temperature. It may be administered very rapidly and in large amounts, and no patient seems to have been adversely affected by its introduction. More detailed hematological and biochemical studies of the effect of its administration in the state of shock, hypoproteinemia, and protein deprivation and loss are being undertaken, and final judgment must await the results. Despeciated bovine serum would, however, appear to meet the three criteria given at the outset of the discussion and listed below as being necessary for a plasma substitute, and may have a useful place in the treatment of conditions in which human plasma protein has been of value.

Substitutes for human plasma hitherto prepared have not fulfilled the three criteria: (a) they must be retained in the circulation and eventually be metabolized; (b) they must exert an equivalent osmotic pressure; and (c) they must be nontoxic, nonantigenic, and free from antibodies.

Bovine serum can be made safe for man by destruction of the antibodies by heating to 72°C, while the proteins are rendered uncoagulable with the addition of 0.2 per cent formalin and ammonia. Material so prepared appears to accord with the given precepts. HERBERT F. THURSTON, M.D.

Gemeroy, D. G.: Agglutinin Titers of Pooled Sera. *Canad. M. Ass. J.*, 1944, 50: 131.

In the past few years the use of pooled serum or plasma has become widely established as a valuable therapeutic measure whenever blood volume restoration is indicated. Although large amounts of serum and plasma have been pooled and stored in recent months for subsequent transfusion, very few studies have been carried out to determine the agglutinin titers of these fluids. Although various workers have stated what they consider the optimum proportions of the different sera comprising a pool, little information is forthcoming as to the final agglutinin titer.

It was believed by the author that further research was needed to see if any variation in the proportions of the different sera used would give titers of a lesser degree than those obtained by the methods already in use. With this in mind the following experimental work was planned and the findings reported herewith: (1) to determine to what extent the agglutinin titers of serum pools varied and the effect of the drying process on the titer; (2) to determine to what extent the proportions of the different sera comprising a pool could be varied and still give a reasonably low final titer; (3) to determine whether sera obtained from the donors' list, in numerical sequence and without regard to type, would give pools with titers as low as when definite amounts of each of the four serum groups were used.

The materials used in these experiences and the methods followed are described. Tabulations are presented showing the agglutinin titers of native and dried sera; the effect on agglutinin titer of varying

amounts of different sera; and the agglutinin titers of special pools.

In the discussion of the experimental results the author notes that it is believed that maximum agglutination is obtained by the mechanical agitation of the serum and cells, and for this reason the plate method may give titers somewhat higher than those obtained with the tube method. In this respect there seems to be a definite need of standardization of methods for the determination of agglutinin titers, otherwise the results are not truly comparable.

The isoagglutinin and agglutinogen contents of different sera vary within wide limits and for this reason it is exceedingly difficult to determine the optimum proportions of the different sera that should be used to make up the pool. Although the amounts of each type of serum used in the present investigation were varied in each pool, nevertheless the titers were fairly constant. None of the combinations here tested have shown agglutinin titers differing significantly from the serum pools prepared in this laboratory with standard proportions of each of the four serum groups. Furthermore, when large amounts of serum are handled daily a pool comprising the various serum groups in the approximate proportions received is most practical.

In concluding, the author states that the agglutinin titers of 50 representative serum pools, both native and dried, were determined. The drying process apparently had no significant effect on the titer of the serum. The agglutinin titers of these pools ranged in value from 1 in 10 to 1 in 60 with both A and B cells, the average being 37 and 30 for A and B cells, respectively.

Variation of the proportions of the four different serum groups comprising a pool may be carried on within fairly wide limits without affecting the agglutinin titer of the pool. The proportions of the different sera as used for a time at the Connaught Laboratories, i.e., O, 46 per cent; A, 41 per cent; B, 10 per cent, and AB, 3 per cent, gave a resultant pool with as low an agglutinin titer as that found with any other proportions of sera tested.

Serum can be pooled without regard to type if a large enough number of samples is used in the pool. This pooling in sequence as the numbers appear on the donors' list gives a final pool that compares favorably with any other combination of sera in its agglutinin titer. This simpler procedure has now been adopted by the Connaught Laboratories.

HERBERT F. THURSTON, M.D.

MISCELLANEOUS

Zucker, H. D.: Clinical Experiences with Dicumarol. *J. Am. M. Ass.*, 1944, 124: 217.

Dicumarol has been criticized from the point of view of difficulty of control, danger of hemorrhage, and toxicity. Zucker reports the use of dicumarol in 18 patients, 9 of whom were suffering from clinically evident thrombophlebitis of the lower extremities. Five patients received prophylactic doses of dicumarol following operation or delivery, because of a history of previous episodes of thrombosis or embolism. Two patients were treated subsequent to a postoperative pulmonary infarction. One patient was treated following a cavernous-sinus thrombosis, and 1 was treated when cavernous-sinus thrombosis seemed imminent. No patients with definite evidence of liver damage or with definite renal impairment were accepted for treatment, because of the experimental evidence that such damage is a contraindication to the use of dicumarol.

All patients were classified according to blood group prior to therapy, and all had daily determinations of the plasma prothrombin level performed in the hospital laboratory on undiluted plasma by the method of Quick. Hemoglobin, red blood, and arterial blood-pressure determinations were made daily.

All adult patients received an initial dose of 300 mgm. of dicumarol by mouth, and the following morning, regardless of the time of administration of the initial dose, an additional dose of 200 mgm. was given. Subsequent doses were given with the aim of maintaining the plasma prothrombin-time level between 60 and 30 per cent of normal; usually 200 mgm. were administered, the dose depending on the absolute level of the daily prothrombin determination and on the slope of the plotted curve of the prothrombin values. The latter is important, for the prothrombin time may be excessively and dangerously lenghtened if a follow-up dose is given while the slope of the curve is upward (decreasing percentage of normal), and, conversely, the patient may escape from the desired range if the prothrombin time is allowed to return to normal. Such a program of dosage permits maintenance of the majority of patients within the desired range of hypoprothrombinemia. Follow-up doses of 300 mgm. or more may be required for patients recognized to be resistant, and a reduction to 100 mgm. is occasionally necessary in susceptible persons.

Treatment resulted in rapid recovery and short convalescence of 8 of the patients treated for thrombophlebitis; there was disappearance of pain in 7, and in 2 others when the therapeutic level of hypoprothrombinemia was obtained.

The prophylactic results in 5 patients, the results in cavernous-sinus thrombosis and in threatened cavernous-sinus thrombosis, and the results in 2 cases of pulmonary embolism seemed to warrant further controlled clinical trials of the drug.

Dicumarol cannot, in the opinion of the author, replace heparin in emergencies demanding anticoagulant therapy, nor should it be used as an alternative to indicated surgical procedures; but it will find its usefulness principally in the prophylaxis of thrombosis and embolism and in the treatment of thrombophlebitis. STEPHEN A. ZIEMAN, M.D.

Barker, N. W.: The Use of Dicumarol in Surgery. *Minnesota M.*, 1944, 27: 102.

Dicumarol has been administered to 624 surgical patients at the Mayo Clinic during the immediate

postoperative period. Experience with these cases indicates that adequate elevation of the prothrombin time by the administration of dicumarol is almost completely effective in the prevention of postoperative thrombosis and pulmonary embolism. It also supports the concept that embolism only develops when the thrombus is of very recent origin and that, therefore, embolism can be prevented in cases of known thrombophlebitis or venous thrombosis if sudden extension of the thrombosis or thrombosis in other veins is prevented. There is no evidence to indicate that dicoumarol has any effect on thrombosis or embolism that has already occurred.

The only untoward effect of dicumarol is that it occasionally causes bleeding. This bleeding may occur at the operative site, from the nose, or from the urinary tract. If bleeding occurs, it can almost always be controlled by the transfusion of freshly drawn citrated blood; occasionally more than one transfusion is necessary. Minor bleeding occurred in 5.3 per cent of the 624 cases. This was of only slight degree and did not require transfusion. Major bleeding requiring transfusion occurred in 3.2 per cent of the cases. It occurred less frequently in cases of thrombosis or embolism than in the group in which dicumarol was given purely for prophylaxis.

The plan of administration of dicumarol in the 624 cases mentioned in this article was as follows:

The drug was dispensed in capsules, each containing 100 mgm. In the cases in which pulmonary embolism or thrombophlebitis had developed, 300 mgm. were given as soon as the diagnosis was made. A single dose of 200 mgm. was given on the following day and on each succeeding day that the prothrombin time was less than thirty-five seconds. No dicumarol was given on the days when the prothrombin time was thirty-five seconds or more. Occasional exceptions were made, however.

Marshall, W., and Rosenthal, S.: Pathogenesis and Experimental Therapy of Keloids and Similar Neoplasms in Relation to Tissue-Fluid Disturbances. *Am. J. Surg.*, 1943, 62: 348.

Keloid formation may be accounted for on a physiological basis. It is due to the stagnation or stasis of tissue fluid in the extravascular spaces, the obstruction of lymphatic drainage, and the transudation of lymph. As a result, collagen is deposited and connective-tissue proliferation ensues. The growth is in an upward direction in line with the force of least resistance. The epithelium becomes atrophic and the keloid increases in size as long as the serous material accumulates. Coexistant with the keloid is a chronic induration due to a residuum of serous material or localized edema.

The use of a vasoconstrictor drug, such as developed by one of the authors, was found beneficial in reducing the size of keloids and hypertrophic scars. The vasoconstricting material was a special extract from liver prepared in accordance with Marshall's technique. The administration was parenteral, usually subcutaneous but occasionally intrakeloidal. In 1 case, as a result of 9 injections of 1/20 cc. of this solution, a keloid was shrunk ½ in. in length and ¼ in. in width. In addition, the keloid became lighter in color and softer in consistency. The latter changes were due to vasoconstriction of the peripheral arterial buds and diminution of the residual edema. Clinically, there was creasing and settling of the keloid.

BENJAMIN G. P. SHAFIROFF, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Cairns, H.: Gunshot Head Wounds in the Acute Stage. *Brit. M. J.*, 1944, 1: 33.

Early in the war the British Army Medical Services encouraged segregation of head injuries under specialists in neurosurgery and neurology both at home and abroad. The principle was based mainly upon the work of the neurosurgical units in the Middle East and North Africa, the first of these being immobilized early in 1940. The unit was self-contained though not designed to nurse or feed its patients and did not usually have its own x-ray equipment. It had its own vehicles, source of electricity for diathermy, suction pump, operating-theater lights, and operating-table heaters. The unit could be set up and ready to operate within an hour in either a building or tent and it could pack up and move in a shorter time. The first unit was in France only a few days before the battle began and it was captured while in surgical charge of some 800 wounded. In Benghazi, eighteen months later, another neurosurgical unit under the command of Major P. B. Ascroft was able to continue to work within a few hours of the Germans' entry and then escaped with all its vehicles and equipment. In Tripolitania and Tunisia another unit enabled the late Major K. C. Eden to keep up with the forward casualty-clearing station and operate on the majority of the head injuries of the 8th Army within twenty-four hours. The equipment has now stood the test of several campaigns and has been partially included in the mobile craniothoracic units of the emergency medical service and the mobile surgical units of the Canadian Army. These units have also, when required, done urgent work outside of their own special field.

Because Henderson in France and Ascroft in the western desert found that but 10 per cent of the wounds were head injuries, it was decided that these units in the future would not work in advance of general hospitals. For Mareth and subsequent battles, with official approval, Eden split his unit into two sections, leaving one with a general hospital in Tripoli while the other one went forward to the most advanced casualty-clearing station. In this way most of the head injuries of the 8th Army were treated at an earlier stage than in previous campaigns. Of 293 head injuries, 188 were operated upon in the first twenty-four hours and only 34 were operated upon after three days. Primary wound healing in this group reached the remarkable figure of 90 per cent.

Wounds of the scalp and skull without penetration of the dura were practically without mortality. Ascroft, Eden, and Schorstein reported 459 such cases with 3 deaths—one from severe cerebral contusion, one from penetration of the lateral sinus by a spicule of bone followed by infection and pyemia, and the last from a tear of the internal carotid artery in the carotid canal. Nonpenetrating wounds are not entirely free from complications—among the cases from Dunkirk there were 2 septic scalp wounds which were followed by intracranial abscess (Cairns, 1941). If these wounds are treated adequately in the initial stages, intracranial infection should be rare. The need for more careful surgical treatment of scalp wounds has been stressed (McKissock and Brownscombe in 1941, and Batterell and Jefferson in 1942). In recent campaigns Eden and Schorstein have been able to return their patients to duty in from ten to twenty-one days, but disability causes a much longer delay when stitched scalp wounds suppurate as the result of inadequate removal of dirt and hair at the original operation.

The results of treatment of penetrating wounds of the head may be summarized by stating that of the cases reaching the casualty-clearing station about 20 per cent died from brain damage within the next few days. If the initial operative treatment is not thorough and an expectant policy is adopted, about 25 per cent of the survivors to be evacuated develop brain abscess or meningitis. This is somewhat similar to the results in World War I in France, but with the difference that intracranial infection was rapidly fatal and few cases survived long enough to develop brain abscess at the base in World War I. Recent neurosurgical work in North Africa has shown that when head cases can be segregated at the casualty-clearing station and can be operated upon radically within twenty-four hours by a fully equipped team of experts there is a considerable improvement in the results and many of the complications can be almost, though not entirely, eliminated. Because of the improvement in technique, better results can be obtained, and when conditions are favorable, the most forward neurosurgical unit should be mobile and capable of sending an operating team to the forward casualty-clearing station. Improvements in chemotherapy and air evacuation may ultimately diminish the need for head surgery in the forward area.

In the penetrating wounds, examination at operation and bacterial studies indicated that infection usually began under the scalp or in the temporal muscle and spread inward to the brain. The great majority of cases were infected; the infection is superficial in the early stages and then spreads inward; therefore, early sterilization of the superficial portions of the wounds would considerably reduce the incidence of intracranial infections.

Preliminary roentgenography to show the location and extent of in-driven bone and metal fragments is essential. Débridement should consist of minimal trimming of the scalp wound, thorough removal of all foreign bodies, removal of sufficient bone to expose the dural opening, and thorough removal of clot, macerated brain, hair, bone chips, and metal. No

attempt should be made to search for deeper penetrating fragments in the region of the sylvian fissure since dislodgment here may produce severe hemorrhage from the cortical arteries. When the wound is cleansed and dried it is dusted with sulfathiazole, which has been used in some hundreds of brain wounds with no reactions. In the absence of gross sepsis the scalp is closed without tension. When the sagittal and lateral sinuses have been injured, removal of bone fragments may produce uncontrollable hemorrhage and blood transfusions should be quickly available if required. In these cases the patient is operated upon in the sitting position which controls bleeding from the sinuses. Wounds involving the eye, accessory nasal sinuses, and brain require major operative procedures—in the acute stage the surgeons may not have sufficient time or the patient may be unfit for such procedures. Schorstein (1944) has had considerable success in these cases with vaseline gauze packs after débridement. The small penetrating head wound with persisting neurological signs calls for special treatment. The osteoplastic flap is the best means of securing adequate exposure of the brain wound and the intracerebral clot which is usually present.

There are good theoretical grounds for believing sulfonamides effectively diminish streptococcal contamination of fresh wounds, but their action on staphylococci is weak and there is no evidence to support the view that they are active in the presence of pus.

Penicillin was used locally in 23 brain wounds with encouraging results. The author believes that at this stage the results following the use of penicillin are promising. BENJAMIN GOLDMAN, M.D.

Adolph, P. E., and Others: Experiences in War Surgery in China. *Ann. Surg.*, 1944, 119: 134.

War surgery must adapt itself to varying conditions and those which prevail in one land may differ from those prevalent in another. Thus, as pointed out by Seymour Barling, conditions which obtained in the wars in South Africa from 1899 to 1902 and Abyssinia from 1941 to 1942 apparently differed sufficiently from those which obtained in fighting in France and Belgium from 1914 to 1918 and from 1939 to 1942 as to warrant a more conservative attitude toward wound excision in the former as compared to the more radical attitude adopted for the latter. Nevertheless, the authors' experience in war surgery on both sides of the lines in several locations in North China from 1939 to 1941 is applicable in a measure to war surgery elsewhere; if not directly, at least indirectly by contrast and comparison.

Briefly, preoperative measures consisted in the discrete intravenous administration of saline and glucose solution (no blood or plasma being available), rest, protein-rich diet, ascorbic acid, sulfonamides, specific treatment for intercurrent disease (particularly malaria), and use of the delimiting tourniquet. As to the general treatment of war wounds, soap and water early became the mainstay in cleaning up war wounds. These were far more efficient than any other antiseptic, regardless of color.

In the case of high-velocity gunshot wounds, conservatism seemed warranted, particularly in the dry climate of North China. It was considered that the dryness of the climate with its abundance of sunshine was responsible for a probable reduction of the number of pathogenic bacteria in the clothing, on the skin, and in the surrounding environment, for similar deductions on this basis have been made by Weddell. These wounds were not excised, when perforating and uncomplicated, aside from excision of the skin about the entrance and exit of the missile in some instances. A clean dressing was applied and the part immobilized. If radical excision is indicated it does not mean that it is necessarily mutilative. The wounds did well, particularly if the treatment was supplemented by sulfonamide in adequate dosage by mouth. Sulfonamide powder, however, was not used locally because it had not become available in sufficient quantity.

Plaster encasements were used to some extent and there was enthusiasm over the results with plaster. Unfortunately the supply of plaster was decidedly limited. It was found, however, that the patients who were put up in wooden splints were manipulated by the staff entirely too much, which disturbed the callus formation and induced infection. This is one important reason why the plaster encasement should supersede the ordinary splint when possible.

Amputation, unfortunately, was necessary in a number of cases, but the use of sulfonamides materially decreased the number of cases in which it became necessary. In the last year approximately 20 amputations were performed in a total of about 200 severe war wounds of the extremities. (This is a rough estimate for the records are in enemy hands and hence unavailable.)

Nonunion was a rather unusual complication of the fractures due to war injuries. The complication most frequently seen was persistent sinus or sinuses due to retained foreign bodies and sequestra. It was found that in the type of case that came to hand several days after injury, it was usually best to let the fractured bones unite firmly and then operate very radically.

Gunshot wounds of the pelvis presented a more serious problem. The osteomyelitis that developed in these cases was not so easily treated as that of the extremities. Probably the failure lay in that they were not opened up widely, the sequestra were not fully cleaned away, and packing was not done thoroughly enough.

If there is indication of a penetrating wound of the abdomen, it is really advisable to explore the abdomen promptly, provided one has the time and place in which to do it. Often seemingly innocuous wounds of the liver result in fatal hemorrhage which is appreciated too late, while perforations of the intestine must be closed early to avoid continuous peritoneal contamination. The results in this category were frankly bad. Incidentally, the old rule-of-thumb is

a good one; namely, that gunshot wounds of the gastrointestinal tract occur in even numbers—one of entrance and one of exit.

As to exploration of chest wounds, the cases in which this might have been done to advantage were seen under conditions in which the operating facilities did not warrant exploration, and this is an important matter. A chest exploration cannot be undertaken without an expert anesthetist. On the other hand, the sucking wound of the chest, which really may represent a fairly serious situation, was found manageable with the simplest of facilities.

Many of the gunshot wounds of the chest responded to simple rest in bed, and sulfonamide by mouth. Unless there was obvious hemorrhage or infection, the authors believed that it was best to let bullets which had lodged in the lungs or mediastinum strictly alone.

Ordinary bullet wounds of the head were usually let alone without unfortunate results. Roentgenograms ordinarily would show the bullet safely couched in some area of the brain where nonintervention would probably cause less damage than its removal.

Banditry was rife in the district surrounding the hospital after the Japanese had taken over the city. Early one morning a bandit came to a farmhouse, where all the members of the household submitted to his demands except the farmer's wife. She was of low mentality and resisted. The bandit picked up the meat cleaver and proceeded to hack away at the vault of her cranium. When she arrived at the hospital, a mass of hair, bones, gray matter, and skin presented itself over the left frontoparietal region. Persistent cleansing with soap and water and physiological saline solution, cutting and shaving of the hair, excision of devitalized skin, removal of bone fragments which had become detached from the pericranium, and cutting away of contaminated and apparently superfluous gray matter, permitted of closure of the scalp. Healing per primam followed, and her relatives and friends all insisted that she was greatly improved mentally after the operation!

Excessive handling, together with an improper original toilet because the patient was seen too late, seemed responsible for the production of erysipelas in some of the burn cases. One of the patients came down with a fulminating attack of erysipelas which progressed promptly into coma. Five hundred cubic centimeters of a solution of ½ per cent sulfanilamide in physiological saline were administered intravenously, which was followed by 200 cc. every four to six hours, with most gratifying results.

Similar administration of sulfanilamide was also resorted to in the gas-gangrene cases. Immediate amputation had been disappointing in the earlier cases. In the later cases, amputation was postponed until after the acute phase had well subsided. In fact, it did not always prove necessary. Despite the fact that there was no antitoxic serum for gas gangrene the last 4 cases were carried through to a successful issue on sulfanilamide therapy, although on the first two or three days they were very toxic. The first day the drug was given intravenously and on subsequent days orally. These cases received no local treatment aside from the establishment of drainage in the simplest manner, changes of dressings, and immobilization, as indicated. Tetanus was encountered, particularly in badly contaminated cases which did not receive proper early treatment.

A case of tetanus developed in a Chinese farmer whom, together with all the young men of his village (about 40 in all), the Japanese had captured, bound in a kneeling posture, and lined up with his fellow-villagers in a dry river bed. Forty Japanese soldiers took their position along the bank and each one was ordered to fire one shot at his respective target. The soldiers were then told to investigate how successful they had been in killing their targets. Those who had been unsuccessful picked up large stones from the river bed and bashed in the skulls of their victims. This patient had a very copious hemorrhage from his right femoral vessels and was thought to be dead. Accordingly he was left. After about two hours, he revived sufficiently to drag himself to his home nearby where he remained until he started to develop symptoms of tetanus. He was then brought in and a suppurating pocketed wound of the thigh was found. Thorough dependent drainage of the wound was established, and all foreign bodies and loose necrotic tissue were removed. About 40,000 international units of antitetanic serum were given intravenously. He was also given an intraspinal injection of 25 per cent magnesium sulfate (7 cc.) according to the technique outlined by Beckman. Thorough relaxation was produced to such an extent that respiratory arrest ensued. Calcium-chloride given intravenously seemed to have little effect in counteracting this, despite Beckman's claim for this as an antidote. Artificial respiration was carried out on him for sixteen hours, after which he started breathing spontaneously. He experienced no further convulsions and made a full recovery. It is felt more strongly than ever that elimination of the nidus of infection, even after the development of clinical tetanus, is definitely indicated, although there is disagreement on this subject.

As regards methods of anesthesia, it was found that the simplest served best under the circumstances. Local anesthesia with novocain was utilized in many of the minor casualties. Open drop-ether anesthesia was used extensively. Evipal was given intravenously in a few instances. Spinal anesthesia and brachial block were employed a great deal, but mostly for cases upon which operation was done a number of days after injury, in which the reaction was favorable.

As to the use of roentgenography, earlier in the war good films were obtained, but during the last year or so, the Chinese guerrillas blew up the electric power plant (December, 1939). Subsequent to this, electric power was only sufficient for the use of the fluoroscope, and that at only certain times of the day. Consequently, the outline of the fluoroscopic shadows was traced on transparent paper superimposed

on the screen. These tracings were used during the operation and found to be very useful guides, for usually the pieces of metal or bony sequestra showed up in sharp relief in relation to the intact bone and soft tissues.

War surgery always is fascinating because each case presents a new problem or combination of problems. Not only is there a multiplicity of missiles, but of the anatomic parts in which they locate and of the directions they take in the human body in its varied contortions. This makes an infinite number of combinations possible. Nevertheless, it seems to be the case everywhere, and the authors' experiences were no exception, that wounds of the extremities are decidedly in the majority. Doubtless many of the wounds of other regions are not so generally amenable to treatment and prove fatal even before they are seen by the surgeon. Then, too, it must be realized that the extremities present a large surface area for encountering missiles out of all proportion to their comparative weight.

JOHN E. KIRKPATRICK, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Owens, N.: A Simplified Method of Rotating Skin and Mucous-Membrane Flaps for Complete Reconstruction of the Lower Lip. *Surgery*, 1944, 15: 196.

The disadvantages of various methods of repairing extensive defects of the lower lip, such as the use of sliding, rotating, and advancing pedicled transplants, are discussed, and a simple method of repair which gives a satisfactory cosmetic and good functional result is described. Repair is accomplished by a combination of advancement flaps of both skin and mucous membrane.

First, a pattern of the defect is made and bisected, as only one-half of the defect is reconstructed from its respective side. One-half of the pattern, anchored at its lateral and upper border, is swung down to outline the margins of the skin pedicle. This pedicle, including skin, fat, and muscle (Fig. 1), is raised, shifted forward into the defect, and wrapped in moist saline gauze. The same pattern is then carried inside of the mouth where the upper and outer point is fixed again, and in the same manner an identical mucous-membrane flap is raised and brought forward to form the linking of the lip (Fig. 2). The vermilion border of the lip is provided for by the slightly greater width of the mucous membrane flap. The defect inside the mouth is closed by direct approximation and the line of closure continues along the entire inferior border of the newly formed mucous membrane flap. The skin flap is then brought up into position and sutured and the resulting skin defect also closed (Fig. 3). The same procedure may be carried out on the opposite side.

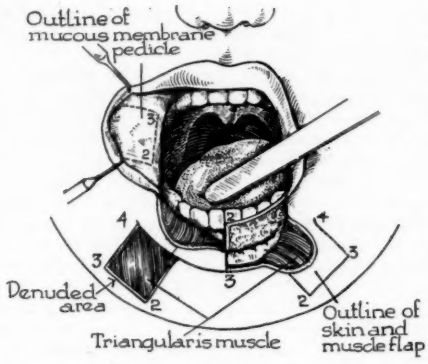


Fig. 2. Drawing showing the outline of the mucous-membrane flap over the buccal mucosa of the cheek on the right. The mucous-membrane flap which was dissected up and advanced forward on the left is clearly shown. The skin and muscle flap on the right has been raised and brought into an upward position; that on the left is merely outlined.

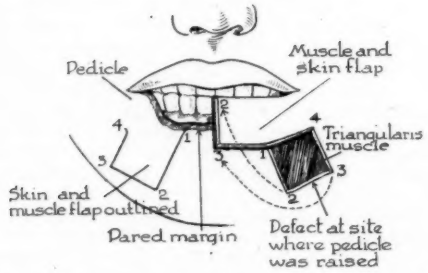


Fig. 1. Drawing showing the flap outlined on the right and the flap dissected up on the left to include skin, fat, and a portion of the triangularis muscle. The flap on the left has been swung up into position for its incorporation with the mucous membrane in reconstruction of the lip.

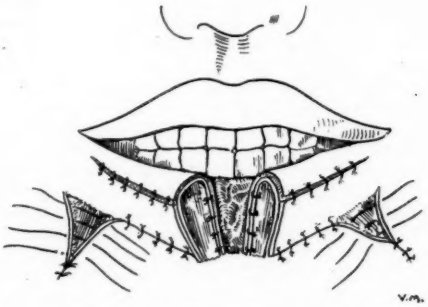


Fig. 3. Drawing showing approximation of the skin and muscle flap with the mucous-membrane flap on either side. It also demonstrates the method of drawing the mucous-membrane flap over the upper margin of the reconstructed lip where it forms the new vermilion border.

This procedure has been carried out on 12 patients with noticeable absence of tightness or shortness of the lips, and in no instance has a patient complained of drooling. JOHN L. LINDQUIST, M.D.

Brown A. M.: Sculpturally Molded Synthetic Implants in Plastic Surgery. *Arch. Otolar.*, Chic., 1944, 39: 179.

The technique of the use of the sculpturally molded methyl methacrylate implant in plastic surgery is described. This substance is transparent to roentgen rays, light in weight, stable, well tolerated by the host tissue, and easily molded. It is not limited in size or shape, does not alter the color of the skin, and does not change in size. Methyl methacrylate is sensitive to alcohols and ketones, and the author sterilizes it by immersion in mercury-bichloride solution. HAROLD C. OCHSNER, M.D.

Pierce, G. W., Klabunde, E. H., and Emerson, D.: Repair of Burned Hands. *Surgery*, 1944, 15: 153.

Attention is focused on repair after the acute stage of a burn of the hand is past. In the palm the median and ulnar nerves with sensory branches to the fingers and motor branches to the intrinsic muscles of the hand, the superficial and deep flexor tendons, and the arterial supply are well protected against quite deep burns.

The conjoined tendons of the lumbricales and interossei muscles should be noted especially; although these muscles are well protected in the palm, their tendons pass along the lateral borders of the fingers and insert into the extensor tendons near the middle joints. Their function is important as they extend the middle and distal phalanges of the fingers and their more exposed position permits frequent damage in many burns.

Second-degree burns cause dismaying deformities. The dorsum of the hand is more frequently burned than the palm, as probably the hand closes instinctively when it is threatened by fire. The denuded areas should be grafted as soon as possible to keep scar formation and contractures at a minimum. Whenever the true dermis is injured, a keloid may occur, as well as when deeper burns occur. If allowed to progress unhindered the fibrous tissue piles up, often to an astounding thickness, and later the aging cells contract, and with the hard thick scar destroy or limit function. The ugly red gnarled surface is a deformity and the intolerable itching and burning of the keloid area, especially in hot or cold weather, yields to no surface medication. If taken early, keloids can be inhibited or softened and flattened with roentgen-ray therapy. The authors believe that the most rapid and satisfactory therapy is reconstructive surgery. Burn scars of this type and degree, when extensor tendons and sheaths are intact, can be quickly corrected. Deeper third-degree burns down through the fascia and tendons, even to the metacarpals, require early grafting with thinly cut skin to obtain an area free from infection before a repair is attempted.

The palm of the hand presents the same problems as does the dorsum with some differences as to structure. The thicker palmar skin may give somewhat more protection, but the thinness of the superficial fascia quickly exposes the deep fascia, once the full thickness of the skin is burned through. While the deep fascia is, indeed, thick and a protection to the tendons in the middle of the palm, that part of the deep fascia over the thenar and hypothenar eminences is thin and easily destroyed, so that even the mild infection of the granulating stage may burrow down around the central portion, attack the tendon sheaths beneath, and freeze the flexor tendons within them. When a keloid follows scarring of the palm, contractions are more pronounced and disabling than on the dorsum, repair is more difficult, and contractures are prone to recur. Reconstruction of functioning flexor tendons is a far more formidable task than that of restoring extensor tendons. Burns of fingers and thumb present special problems. On the dorsum second-degree burns, especially those complicated with keloid, checkrein flexion of the fingers. Deeper burns of the dorsal surface of the fingers involve the extensor tendons and also the tendons of the interossei and lumbricales muscles.

A deformity commonly seen with severe burns is complete loss of covering over the middle joints and complete loss of extension of the middle and distal phalanges. The contiguous articulating surfaces of the proximal and middle phalanges are often eroded and subluxation may occur because of the loss of ligamentous support. The ligaments of the interphalangeal joints consist of the anterior ligament and two strong lateral ligaments. Posteriorly, the extensor tendon covers the joint and takes the place of a posterior ligament, blending with the lateral ligaments. Because of this structure, burns of the dorsum of the fingers need not be very deep to result in disruption of the joint. Contractures of the webs of the fingers are very common and are especially difficult to repair when they are accompanied by much keloid. Over the dorsum of the thumb and over the first metacarpal, locking scars are common and demand complete removal for functional return. The web between the finger and thumb is very vulnerable to damage and contractures here commonly limit abduction to a marked degree. On the volar surface great shortening and bowstring contractures are the rule. Extreme contractures in the palm, especially at the proximal third, are most disabling, as they draw the thumb into the path of the normal arch of the palm. Tissues involved by burns demand special attention and require complete removal of the offending tissue and replacement by normal tissue.

In reconstruction, Davis grafts should almost never be used. Thiersh grafts are of little value for permanent repair, because of a tendency to contract. Free skin grafts of various types, transposed flaps and the tubed pedicled flap of Gilles are the major armamentarium of the surgeon. The authors favor the use of split-skin grafts, cut with the Padgett

dermatome. Contracture should be avoided in the web of the thumb. Transposed flaps of skin and subcutaneous tissues are best when extensive reconstruction is desired; the hand should be placed under the flap of the abdominal wall and the skin which is removed should be replaced with split grafts. Several cases are presented and the manner of their treatment is shown in photographs. Tubed pedicled grafts are also excellent for use in reconstruction.

After reconstruction the patient requires aid in restoring function. After many years of experience with the heat and massage treatments of physical therapy, they have been discarded. The finger joints react badly to forced manipulation; therefore the authors have adopted simple elastic traction to take its place. After each removal of the bands the patients are instructed to massage the joints—never to rub the finger over the skin, but to use deep massage by moving the skin along with the finger doing the massaging. Exercise should be encouraged.

After burns a condition occasionally arises which is frequently associated with crushing or lacerating injuries of the hand. An area of irritation along the course of a vein or blood vessel sets up a series of impulses and produces an abnormal vascular response.

The patient presents a characteristic picture, the hand is cyanotic, clammy, and moist. It is held in the position of semi-flexion and the patient resents any attempt at manipulation. There is atrophy of the soft tissues, with swelling about the joints of the fingers. The skin is smooth, shiny, and delicate, and has lost most of its natural folds and markings. The patient complains of pain of a vague aching or burning nature, which is almost continuous day and night and is aggravated by cold. The pain often radiates to the wrist, elbow, or shoulder. There may be paresthesia, anesthesia, or hyperesthesia of the fingers or hand. The grip is weak and the hand is almost useless. A close analysis shows hypesthesia to pinprick, which may be almost complete, involving one or two fingers, or the entire hand in a glove distribution. Along with atrophy of the skin and soft tissues, there is shortening of the capsular ligaments of the joints so that the fingers and wrist become stiff and attempts at motion are painful. This, in turn, leads to further atrophy of disuse. The mechanism of the lesion is not known at the present time.

Early diagnosis is important, as the soft-tissue atrophy may lead to irreparable damage, especially stiffening of the joints. Interruption of the vicious cycle of vasoconstriction is brought about by injection of 1 per cent novocain about the ulnar and radial nerves and arteries at the wrist. This should be done twice a week at first and then at longer intervals as indicated. The immediate effect is remarkable. In persistent cases some advocate injection of the cervical stellate sympathetic ganglion or even its removal. LEROY J. KLEINSASSER, M.D.

Adams, W. M.: Free Transplantation of the Nipples and Areolae. *Surgery*, 1944, 15: 186.

Free transplantation of the nipples and areolae offers an advantage over the usual types of mammary plastic operations in that reshaping of the breasts can be completed before any attempt is made to select the new sites for the nipples. Two cases of successful free transplantation are reported and the end-results illustrated.

The nipples and areolae were dissected as for obtaining a full-thickness skin graft under local anesthesia with 1 per cent novocain. Care was used to avoid including any subcutaneous or fatty tissue, but near the nipples the dissection was made deeper in order to include some of the smooth muscle tissue. The free grafts were wrapped in gauze wet with cool normal saline solution. Under cyclopropane anesthesia elliptical incisions corresponding with the submammary folds were made on the anterior and under surfaces of the breasts and the redundant mammary tissue was removed.

The remaining breast tissue was reshaped with the patient in a near-sitting position and the wound margins were sutured. The new sites for the nipples were selected and outlined with the patient still in the near-sitting position, and circular areas of skin were excised so as to leave a thin basal layer of dermis. The free nipple and areolar transplants were sutured in their new location. Elastic pressure dressings carefully applied to exert uniform pressure and to immobilize the breasts are considered an essential part of the procedure.

The first dressing was done on the tenth postoperative day. There was a complete take of the nipple and areolar grafts. After three months there was evidence of return of tactile sensation and erection in the nipples and areolae, which proved that function of the grafted portion of the smooth muscle had returned. The cosmetic result was excellent.

JOHN L. LINDQUIST, M.D.

Massie, F. M.: Amputation with Refrigeration Anesthesia. *South. M. J.*, 1944, 37: 1.

Tissue can survive long periods of asphyxia without damage, if the temperature of the ligated part is kept between 32° and 40° F. The time limit for asphyxia of human tissue has not been fully determined, but it may exceed fifty hours for the leg and thigh. When the ligated tissue is to be removed by amputation, the tourniquet may safely be left on for four or five days, or even longer. The former dictum that tourniquets should be released every hour was based on the rapid death of asphyxiated tissue at room temperature, and the fatal shock which often followed the removal of a tourniquet which had been kept in place for more than two hours.

The complete anesthesia resulting from refrigeration and asphyxia is due to the absence of all metabolic changes in the cells of the affected part. Because no physicochemical changes are possible in the cell under these conditions, the cell is unaffected

by any stimulus. A protoplasmic anesthesia is thus produced.

The technique of producing this anesthesia is now becoming standardized. It is important that freezing of the tissue does not occur, since cells are irreparably damaged if frozen. Freezing cannot take place if cracked ice is used as a pack without the addition of salt. The tourniquet should be of gum rubber, stretched almost to its full extent as it encircles the limb for two turns. Compression will not be sufficient if the tourniquet is pulled tight after it has encircled the limb. The tourniquet should be next to the skin, and the compressed area should be as narrow as possible. A heavy hemostat, parallel with the skin surface, should be used to fix the tourniquet, which may be placed well above the zone of amputation. Application of the tourniquet is accompanied and followed by pain, unless the area about which it is to be placed is chilled with ice for several hours beforehand. Just before the tourniquet is applied, the limb is raised, to drain out most of the blood; as soon as the constrictor is in place, the limb is returned to its ice pack for two hours, if the amputation is to be below the knee, and for three hours, if above. The ice pack is carried well above the tourniquet level before and after the tourniquet is placed in position. A large rubber sheet is used, on which a thick layer of finely cracked ice is placed. The limb is put on this ice bed, which extends well above the tourniquet level and includes the foot or hand. A thick layer of ice is then placed all around the limb, and the whole is covered with rubber sheeting and blankets. The sheeting extends beyond the lower end of the bed, so that the water may drain off. From 50 to 100 lb. of cracked ice are used for four or five hours of refrigeration. If at any time discoloration of the limb is seen, the tourniquet has not been applied tightly enough. In such cases, the tourniquet should be reapplied.

Barbiturates are used to allay anxiety before the operation. The anesthesia produced by this asphyxiation and refrigeration is complete for any operation requiring a period of an hour. After the amputation, the larger vessels are tied and then the tourniquet is released. The bleeding is found to be normal, the tissues fresh and red. One gram of sulfanilamide is placed over the stump, and the flaps are closed loosely, without drainage. These amputations can be done without any discomfort to the patient, and without a fall in blood pressure or a rise in pulse. Three or four icebags are kept on the stump, superficial to a light dressing, for from four to seven days after the operation, and are then removed—one each day. This procedure delays healing, so that sutures should not be taken out for two weeks, unless infection in the wound demands their removal.

This method of amputation has so reduced the mortality and morbidity in a group of severely ill, debilitated patients, that the principles will probably be applied to infections, cellulitis, and trauma, in which amputation may not be necessary. By the ice and ligation method the mortality was reduced from a previous rate of 65 per cent to 15.5 per cent in one series of cases reported, and to 28.5 per cent in the series herein reported. SAMUEL KAHN, M.D.

Tidrick, R. T., and Warner, E. D.: Fibrin Fixation of Skin Transplants. *Surgery*, 1944, 15: 90.

Early in normal healing, newly forming connective tissues and blood vessels utilize fibrin as a scaffold upon which to build and, perhaps also, as a source of nutriment for the proliferating cells. Artificially supplied fibrin might be expected to aid the healing process, particularly in wounds in which little or no fibrin could be expected to form by natural exudation. This report is a summary of clinical studies on fibrin fixation of skin transplants with the use of active thrombin to effect rapid clotting of the plasma in the operative field.

The preparation used was "Thrombin Topical" in the form of sterile lyophilized powder in small vials, each containing 75 mgm. of the material. The vial was sterilized immediately before use by immersion in antiseptic solution, and then rinsed with sterile water or saline solution to prevent contamination of the contents with germicidal solution. The contents of one vial were dissolved in 10 cc. of sterile water or saline solution. Donor skin, to be transplanted, was first saturated with human plasma by immersion of the tissue in a container of plasma. (Citrated plasma from the hospital blood bank was used in the majority of the cases.) The recipient bed was flooded with thrombin solution immediately before the graft was placed. By this technique, the fibrinogen in the plasma with which the graft is saturated clots almost instantly and fixation of the graft in the clot is accomplished within a few seconds. The grafts must not be moved after being placed; otherwise, the clot is broken up and fixation of the graft is less satisfactory.

Fibrin fixation of skin transplants was used in 122 separate operations performed on 53 patients. The cases were divided into three categories: (1) primary grafting procedures in which clean operative wounds were grafted immediately, (2) burns, and (3) other types of chronically infected granulating wounds.

There were 9 cases of the primary graft type. In 8 of these, split-thickness grafts, obtained with the Padgett dermatome, were used, and in the ninth a full-thickness graft was used. Defects ranging from 4 to 32 sq. in. in area were covered with large sheet grafts. Fixation of the grafts in the fibrin clot was quite satisfactory and reduced considerably the number of sutures needed to hold the grafts in place. Successful takes resulted in more than 90 per cent of the cases. However, excellent results were to be expected in these cases with the usual technique of simple suture of the transplants in place. For this reason, it is difficult to evaluate the usefulness of fibrin fixation in terms of the final result. In several of the cases the hemostatic action of the thrombin applied to the recipient bed proved very helpful in checking hemorrhage from the recipient bed.

The second group of cases consisted of 77 grafting procedures in connection with the treatment of burns in 16 different patients. In only 4 cases were grafting procedures performed earlier than one month after the burn was sustained. The remainder of the patients had had chronic granulating wounds for periods ranging up to seventeen months prior to admission. Many of the patients were markedly debilitated and the granulation tissue was often badly scarred and of very poor quality. The granulating areas ranged in size from one-tenth to one-half of the total surface area. In 66 of the grafting procedures, the grafts were of the split-thickness type. Occasional sheet grafts up to 32 sq. in. in area were used, but for the most part the grafts were cut into "postage stamp" pieces. The fibrin fixation technique used was of great immediate mechanical aid in holding the grafts in place during the operation and during the application of the dressings. The hemostatic action of the thrombin used as the clotting agent for the plasma proved valuable in preventing hemorrhage from the granulation tissue. This was true particularly in some of the cases in which it seemed advisable to cut away portions of the exuberant granulation tissue at the time of the grafting operation. The grafts were usually protected by a plain gauze screen or wax mesh-gauze screen. In a number of the cases the grafts were left entirely open and merely protected from trauma by a wire cradle. In these, the fibrin proved adequate for mechanical support of the grafts in co-operative patients.

The artificially supplied fibrin clot has also proved very useful in fixing the gauze screen to the wound, by flooding the screen with a small amount of plasma and thrombin after it is placed in the desired position over the wound. Subsequent autolysis of the fibrin clot with loosening of the grafts, or of the screen, was not a troublesome feature. This is very valuable in that it permits resumption of aggressive treatment of extensive infections early in the postoperative period. Also, the stability of the grafts permits greater activity on the part of the patient during this period. The percentage of successful takes was 78. In the remaining 11 grafting procedures in burn cases, the grafts were of the "pinch" type. The percentage of successful takes in this group (73 per cent of all grafts survived) was not quite as high as in the case of the split-thickness grafts, but in general the pinch type of grafts were elected in the less favorable cases.

There were 35 grafting procedures in chronically infected wounds, other than burns. Most of these were cases in which the chronic granulating wounds followed surgical treatment of severe infections. Of these, 13 were of the split-thickness type and 22 of the pinch type. The results in these (68 per cent) were slightly less favorable than in the burn cases. The usefulness of the fibrin clot for mechanical support of the graft was more evident perhaps in this group of cases because of the nature of some of the wounds.

In the entire series, there were about 8 per cent of the grafts in which "late slough" occurred from two to four weeks after operation. The evidence does not indicate that the presence of artificially supplied fibrin either increases or protects against this complication.

There had been no local or general untoward reaction.

In a number of the cases, thrombin in wounds was used along with large amounts of the drugs of the sulfonamide group. In these, there had been no suggestion that the drug interfered with the activity of the thrombin or vice versa.

ERNEST E. ARNHEIM, M.D.

Wright, R. D., and Devine, J.: Body Temperatures in Shock. *Med. J. Australia*, 1944, 1: 21.

The most reasonable interpretation of the appearance of the skin in cases of shock is that a constriction of the blood vessels is present. The available data appear to indicate that this vasoconstriction is due to a nervous mechanism, and that the peripheral vasoconstriction is a reaction to pain. With the advance of the condition of shock, a reaction to the reduced circulating blood volume and low arterial blood pressure is initiated.

Cooling of the skin leads to diminished blood flow, and this has been shown to be due partly to reflex action and partly to direct action of the cold upon the vessels of the skin. The reflex effect may extend beyond the part cooled to the opposite side of the body—the consensual reflex. It is thus possible that the condition existing in the skin of patients suffering from shock arises first from reflex vasoconstriction due to the initial injury, and that it is maintained by the continuing coldness of this part of the body. When the circulatory system becomes embarrassed by reduction of the blood volume, the skin vessels are constricted and so the state of coldness persists.

If the low skin temperature is due to a compensation for reduced blood volume, any increased cutaneous blood flow required to maintain a normal body temperature will reduce the blood volume available for circulation through the deeper structures. It is therefore important to consider the effect of elevation of the surrounding temperature on a patient in shock.

It has been shown that the skin temperature of people in a thermally comfortable environment is normally between 32° and 35° on the upper parts of the arms and legs and falls as the extremities are approached, where it is often no higher than the environmental temperature, particularly at the toes. The skin temperature of the extremities decreases when the extremity is raised and increases when the extremity is lowered.

The skin temperatures of 6 patients suffering from shock were taken and found to vary exceedingly; there was no correlation with the degree of shock, but they depended on the temperature of the environment.

On the other hand, in 19 patients admitted to the hospital in shock, the average rectal temperature was 99.3° F. and the average oral temperature was 96.7° F.

The skin temperatures and oral temperatures, however, seemed to follow each other; when the skin temperature was low the oral temperature was found to be low, and vice versa. It appeared, therefore, that in cases of shock the mouth temperature gives no real indication of the internal body temperature. In 1 case in which the rectal temperature was 97.6° F., the patient had been subjected to a very low environmental temperature, which had reduced the temperature of an ambulatory patient, who had received minor injuries in the same accident and was not suffering from shock, to 97.8° F. This observation showed that if a normally clothed person stays still in an environment with an operative temperature below 77° F., the general body temperature gradually falls. The patient suffering from shock tends to remain very still, so when he is in a cool environment he has a lower temperature.

However, it seems that in the cases reviewed, there was a tendency toward a rise of the internal temperature in shock, or, at least, not toward a fall. This is physiologically reasonable, for a cutaneous vasoconstriction is an early response in shock and results in diminution in heat loss, which may or may not be considered protective. The raised rectal temperature may have some bearing on the pulse rate in cases of shock, for a raised temperature causes an increase in the pulse rate. Further, there was noted in the series a pronounced increase in the normal interval that exists between the rectal and oral temperatures; the average difference was 2.6° F. in cases of shock and 1.1° F. in the controls.

The application of heat to 1 patient who had been exposed to a low temperature for nine hours after injury and in whom the rectal temperature was 99° F. resulted in a fall of the rectal temperature to 97.2° F., presumably because the circulation into the cold parts of the body was opened up by the applied heat.

In some cases in which no heat was applied after admission to the hospital and in which the patients were merely covered with blankets, the rectal temperature rose well above normal limits.

The practical considerations arising from the authors' observations were:

1. Heat should not be applied to patients suffering from shock until the rectal temperature has been taken.

2. Repeated observation of the rectal temperature following admission to the hospital will prevent deleterious overheating of the patient.

3. Heat should not be applied to a patient unless facilities are at hand to supplement the loss of circulating blood that occurs as a result of change from peripheral vasoconstriction to vasodilatation.

4. "Shock cradles" need close supervision and probably should not raise the air temperature above 90° F.

STEPHEN A. ZIEMAN, M.D.

Greeley, P. W.: The Plastic Repair of Scar Contractures. *Surgery*, 1944, 15: 224.

Thirteen well illustrated cases are reported to demonstrate the value of the author's method of plastic repair of scar contractures. The author believes that scar contractures can be relieved by the excision of all shortened fibrotic tissue, after which the parts are extended into normal anatomic position. The resulting cutaneous defects are then closed by means of a Z-plastic procedure or the utilization of a properly selected type of skin graft.

Scar contractures may be prevented by the early covering with skin of the granulation defects resulting from burns or avulsions of skin. Careful planning in the suture of lacerations may likewise prevent the development of contractures if the line is closed in a staggered axis.

All contractures in growing children should be corrected before permanent underlying bony maldevelopments occur. Moreover, chronic ulcerations occurring in certain contractures should be repaired promptly to avoid secondary malignant changes.

HAROLD C. OCHSNER, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Hoxworth, P.: The General or Supportive Treatment of Wounded Persons. *J. Am. M. Ass.*, 1944, 124: 483.

In the treatment of wounded persons, general supportive measures are required to overcome the effects of severe hemorrhage and shock, to secure proper water balance and nutrition, to aid in wound healing, and to combat infection. An attempt is made to maintain optimal physiological conditions in order to enhance local healing and aid in general recovery. Hoxworth describes the methods employed in the supportive management of wounded persons at the Cincinnati General Hospital, Cincinnati, Ohio.

Once it is determined that severe hemorrhage has occurred, the patient is placed in the shock position (except for chest injuries), morphine is given, and an intravenous infusion of 5 per cent dextrose in saline solution is begun. Plasma obtained from the blood bank is substituted for the dextrose-saline mixture as soon as possible. The amount administered is governed by the vital signs and the magnitude of the surgical procedure which is contemplated. In the meantime, a sample of the patient's blood is matched and compatible whole blood is given if and as long as is indicated. Repeated hematocrit and plasma-protein determinations of the patient's blood are valuable aids in controlling fluid therapy.

The management of injuries which are likely to result in shock includes this regimen, with free use of morphine and without the substitution of whole blood for plasma before the patient is stabilized. At such time, whole blood is given to correct anemia if it is present. Once the shock mechanism is corrected by plasma transfusion and local treatment to the contributing cause, attention is directed to pre-

serving adequate hydration and securing water balance between the tissues and the circulatory system. Loss of water, proteins, and electrolytes occurs initially in injuries, and is continued in burns, empyema, and peritonitis. The degree of moisture in the skin and tongue, the record of fluid intake and urinary output, and plasma-protein and hematocrit determinations are important indexes to the state of hydration and protein balance. Intravenous infusions of dextrose-saline mixtures are needed to supplement the oral intake to meet caloric and electrolyte requirements, while plasma and whole blood must be given if the hematocrit and plasma-protein levels are subnormal. Chloride balance is important, but excessive amounts of chloride must not be administered as tissue edema may occur, especially in conjunction with hypoproteinemia. The use of plasma-chloride and carbon-dioxide-combining-power determinations are valuable laboratory aids. Nutrition requirements may be met by giving 10 per cent dextrose solutions instead of the 5 per cent solutions, and by the oral or intravenous administration of amino acids. Pre-existing vitamin deficiencies are treated while patients are largely on parenteral feedings, by giving appropriate amounts of thiamine, riboflavin, niacin, vitamin C, and vitamin K.

Anemia resulting from blood loss due to the injury, antedating the injury, or secondary to sepsis following injury is treated by the administration either of whole blood or of red blood cells (obtained during plasma production) suspended in 5 per cent dextrose and an isotonic solution of sodium chloride. Both patient and donor have examinations of the blood for Rh factors, as well as A and B factors, so as to eliminate possible hemolytic transfusion reactions which are observed when Rh blood is given repeatedly to Rh individuals. EDWIN J. PULASKI, M.D.

Altemeier, W. A.: The Treatment of Fresh Traumatic Wounds. *J. Am. M. Ass.*, 1944, 124: 405.

The primary purpose of the treatment of fresh traumatic wounds is to save life by the prevention or arrest of hemorrhage, the relief of shock, and the prevention or control of infection. Emphasis is placed on the arrest of hemorrhage in most wounds simply by the use of pressure over sterile gauze dressings applied directly to the wound.

Elevation of the part may aid greatly in the arrest of venous bleeding. A tourniquet is used only in cases of severely crushed extremities, in which amputation is obviously necessary, and then it is applied as close to the wound as possible.

A sterile gauze dressing is applied to the open bleeding wound, not only to control the bleeding but also to minimize bacterial contamination. A high degree of secondary contamination may occur during the administration of first aid, and during transportation of the patient to the hospital, and the author believes that no attempt to cleanse or sterilize the wounds in the receiving ward should be made.

Patients who are in shock are treated by all modern methods, including oxygen therapy.

In the case of operative wounds, a "dry débridement" is done after thorough cleansing of the skin, but irrigation of the wound is not performed at this stage. Upon completion of the mechanical cleansing, the cavity is ready for irrigation and large quantities of warm saline solution are slowly and gently poured into the wound. The cleansing is aided by gentle rubbing of the raw wound surface with the gloved finger.

There is ample evidence that primary deep repair and closure of the wound is a safe and correct surgical procedure in civil practice if the débridement has been adequate, the time interval less than six hours, the blood supply sufficient, and if the approximation of tissues by sutures is possible without tension.

In such a wound, fine black silk is used throughout for the repair of tendons, nerves, fascia, and skin. If primary closure is not possible without tension, the wound is either packed open with saline or petrolatum gauze, or covered with a graft of intermediate thickness. Wounds more than from six to eight hours old are usually already infected locally and should be left open for postoperative drainage.

Healing is facilitated by the application of moderate and uniformly applied compression over the wounded area. Immobilization of the injured soft parts by means of splints, casts, or molds is just as important as that of the bony parts.

The author does not think the local application of sulfa drugs has decreased the incidence of infections, but the general administration of these drugs has apparently been of definite value in the treatment of patients with traumatic wounds.

HOWARD A. MCKNIGHT, M.D.

Toland, J. J., Jr., and Kornblueh, I. H.: Industrial Injuries to Fingers. *Pennsylvania M. J.*, 1944, 47: 466.

In a survey of 3,000 industrial accidents conducted by the authors, it was found that 9.2 per cent produced injuries to the hands and 33.6 per cent, injuries to the fingers. The variations of statistics of different authors usually depend upon the occupational source from which the injuries are obtained. With a total number of 1,008 industrial injuries to the fingers, the authors submit a special analysis of 567 injuries as obtained in 500 accidents. There were 272 injuries to the fingers of the right hand (54.5 per cent), and 228 to the fingers of the left hand (45.5 per cent).

One (single) finger was injured in 456 accidents (91.2 per cent) and more than one finger was injured in 44 accidents (8.8 per cent), with a total of 111 injured fingers as follows:

Fingers Injured	Accidents
1	31
3	6
4	4
All fingers of one hand	3
	44

An analysis of another group of 150 injuries with 164 involved digits showed injury to the fingers as follows:

Finger	Right hand (92 fingers, 56.1%)	Left hand (72 fingers, 43.9%)
Thumb	24 (14.62%)	10 (6.10%)
Index	32 (19.50%)	23 (14.02%)
Middle	20 (12.19%)	22 (13.41%)
Ring	11 (6.76%)	9 (5.48%)
Little	5 (3.05%)	8 (4.87%)

One (single) finger was injured in 138 accidents (92 per cent) and 2 or more fingers were injured in 12 accidents (8 per cent). A total of 26 fingers of both hands suffered a trauma in 12 accidents. It was noted that in this group there were more multiple injuries to the digits of the left hand.

In both groups there were, in general, more injuries to the digits of the right hand than of the left. In their survey, the authors found that the right index finger was most frequently traumatized.

Injury	No. of Cases	Per cent of Total
Contusions	81	16.2
Abrasions	7	1.4
Lacerations and incisions	175	35.0
Lacerations with injury to nails or avulsion of the nail	30	6.0
Fractures, simple and complicated	23	4.6
Puncture wounds	18	3.6
Burns	5	1.0
Sprains	2	0.4
Luxations	1	0.2
Traumatic amputations	13	2.6
Crushing injuries	13	2.6
Infections, primary and secondary	107	21.4
Foreign bodies	25	5.0
	500	100

The first aid treatment at the factory should be restricted to the application of a sterile dressing. When necessary, a splint and a sling should be used and the patient directed at once to a physician. Burns should be treated the same way and covered only with a sterile dressing. All self treatment should be avoided.

Surgical skill, good judgment, profound experience, and a great deal of time are required in order to treat successfully many an injury belonging to this group. The tissues should be handled gently. Neutral soaps, distilled water, sterile physiological salt solution, ether, or benzine are the best solutions for cleansing. Irritation with chemicals should be avoided.

The recommended technique of wound treatment is as follows:

Each new patient with injuries to the fingers must first have his wound carefully examined for possible fracture, severed tendons, and nerves. Minor cuts and abrasions require cleansing and a dry sterile dressing only. A good dressing and elevation of the extremity will also control minor bleeding. The repair of larger wounds may be performed under local, but preferably under block or general, anesthesia; the latter is obligatory in multidigital traumatization. The surroundings of the wound are then thoroughly cleansed with soap and water and the same procedure is gently applied to the wound itself, which is afterward rinsed with copious amounts of a warm sterile saline solution. Greasy fingers should also be cleansed with ether, or the less expensive benzine, and then again rinsed with physiological saline solution.

When necessary, a débridement is performed and devitalized tissue and foreign bodies are removed. Upon completion of the intended repair, the wound is closed, after careful approximation of the edges, with a few loose, interrupted sutures. If thorough débridement is impossible, the wound should be left open. Application of a sterile dressing with extensive use of vaseline gauze, immobilization, and elevation of the extemity are the last steps.

Primary grafting is indicated when large areas of denuded tissue are present. Finger amputations, suturing of tendons and nerves, repair of compound fractures, and grafting débridement should always be done in a hospital. Simple or slightly comminuted fractures of one or more phalanges, without marked displacement, require immobilization with splints for two to three weeks, and then treatment with moist heat and light massage. Restoration of full mobility and prevention of ankylosis of the adjoining joints are assured by the short duration of immobilization. A complete bony union, even under normal conditions, cannot be expected before the lapse of from two to six months. After reduction of the compound fracture and eventual repair of severed tendons and nerves, the wound is filled with small amounts of sulfa compound and closed with interrupted sutures. The finger is then immobilized in the correct position and not disturbed for from at least four to six days. In fractures of the distal phalanx, the nail is the best natural splint and should be preserved as long as possible. Phalangeal fractures with marked dislocation require the application of traction splints.

The peculiar anatomy of the fingers makes it advisable in cases of severed flexor tendons to repair first the tendon of the deep flexor muscle and then the tendon of the flexor digitorum sublimis, provided that the repair can be performed at a different level. A repair of both tendons at the same level frequently causes adhesions between the tendons themselves and the surrounding tissues, which inhibit or even abolish the possibility of flexion. If the cut tendon is seen after four hours, it is better to postpone the repair of the tendon for from four to six weeks, and in the case of infection, for at least six months. A

fracture of the dorsal articular facet of the distal phalanx, i.e., the point of insertion of the extensor tendon, the so-called baseball finger is immobilized in overextension for one month.

Secondary repair of the nerves and tendons may be undertaken within from three to eight weeks provided the wound has healed without reaction and the tissues are soft and the joint is mobile. If infection has supervened, a period of from four to eighteen months must elapse before secondary repair can be undertaken. Often, joints must be mobilized and cutaneous scars replaced by pedunculated flaps before secondary repair can be done.

Acriflavine is used by the authors for burns. It is applied after thorough cleansing of the burned finger, followed by opening of all blisters and removal of the necrotic skin. From 20 to 25 per cent sulfathiazole in a special base has proved quite satisfactory in burns involving small areas. The best therapy for electric burns without visible loss or discoloration of tissue at the time of the first treatment is conservative. Wounds caused by human bites or by indelible pencils should be thoroughly excised and never closed primarily.

Secondary osteomyelitis requires the usual surgical treatment with incision, curettage, drainage, moist heat, x-ray, and chemotherapy, and occasionally even amputation of the involved digit. The fact that even a small finger stump is useful should be always kept in mind while an amputation is being performed. Repair of traumatic amputations often requires some shortening of the protruding phalanx. Grafting of fingertips is a far better technique than removal of larger parts of the bone in order to recover larger skin flaps. Injection of oil into subcutaneous tissue causes at first a symptomless nodule, called oleoma. This nodule should be removed. Injection of air accidentally, under pressure, should be treated by multiple incisions. Wounds treated from three to six hours after the accident (with seven hours as the limit) can be rendered surgically clean. Primary repair of severed tendons and nerves should not be attempted after three or four hours. The topical use of the sulfonamides is certainly indicated and no toxic reactions have been noted in 900 patients. A high protein diet is indicated, as well as vitamins, especially vitamin C.

LeRoy J. Kleinsasser, M.D.

Smith, C. H.: Compound Fracture of the Fingers. *Ann. Surg.*, 1944, 119: 266.

The Orr-Trueta method of treatment was applied to 38 compound fractures of the phalanges. Each injury was treated as an emergency in the operating room. Except for the wound proper, the hand was mechanically cleansed and an antiseptic applied. A tourniquet was used. The wound was explored for foreign bodies and cleansed with sterile saline solution. Damaged and necrotic tissue was excised. If the nail was involved it was completely removed to allow for drainage and to eradicate a source of infection. Blood vessels, nerves, and tendons were preserved if possible. The wound was frosted with sulfanilamide crystals and the fracture reduced. The skin was not sutured. The injured finger was immobilized in an encasement of plaster made up of anteroposterior and radioulnar splints molded together. A prophylactic dose of gas-gangrene and tetanus antitoxin was given.

In 11 cases hospitalization was required for a total of thirty-three days; in 16 there was no loss of working time. Dressings were done at intervals of one to two weeks. Three secondary amputations due to gangrene, nonunion of fracture, and causalgia were necessary. Plaster encasement was found superior to other types of finger splinting in that it permitted perfect immobilization, protected against further injury, and allowed the patient to return to work with no discomfort.

In every case the functional end-result was good. The average medical cost per patient to the insurance company was $33.25 and the total cost per patient averaged $93.87, which represents, in the opinion of the author, definite economic and manufacturing advantages.

Benjamin G. P. Shafiroff, M.D.

Wilkinson, A. W.: Burns and Scalds in Children. *Brit. M. J.*, 1944, 1: 37.

The mortality rate in young children following burns and scalds still remains relatively high, even when early efficient treatment is provided. There has also been an increase in the incidence of burns which has been aggravated by the reduction in the number of available hospital beds.

This report is based upon 366 cases which occurred between June 1, 1938 and July 31, 1942. The causal agents were many, but the most common was the upsetting of a cup of tea. This injury usually produced burns of from 5 to 10 per cent of the body surface. There were 91 such cases with 1 death. The overturning of teapots, kettles, saucepans, and other utensils, together with falls into a pail of hot water, bath or washtub, counted for an additional 194 cases, and the entire group represented 285 cases, or 77.9 per cent. There were 8 deaths in the entire group. Falling into fireplaces, and the ignition of clothing, lighted paper, or celluloid combs, resulted in 64 cases, or 17.4 per cent of the total, with 7 deaths. The remaining cases were miscellaneous burn accidents with 2 deaths.

The author points out that bad accommodations and overcrowding are not so important a factor as the domestic habits of the family. With regard to the extent of injury in relation to the mortality, 244 patients had burns of from 5 to 15 per cent of the body surface with a mortality rate of 2.46 per cent; 54 suffering from burns of from 15 to 45 per cent of the body surface gave a mortality rate of 13 per cent. There were 9 in whom the burned area was between 50 and 65 per cent with a mortality rate of 55.5 per cent. There were 59 patients with burns of less than 5 per cent of the body surface with no mortality.

The author points out the further need for intensive propaganda relating to the prevention of burns and a closer co-operation between hospital staffs and social service. The mortality rate in the entire series of 366 cases was 4.9 per cent.

BENJAMIN GOLDMAN, M.D.

Farmer, A. W.: Early Treatment of Burns. *Surgery*, 1944, 15: 144.

The subject of burn treatment may be divided into that designed for prevention and that designed for cure. Therapy designed for cure is divided into early, intermediate, and late therapy. The early treatment may be said to have ended when the first week has passed. This time is chosen because then the initial phase of primary and secondary shock has elapsed. The liver and kidneys are beginning to show evidence of recovery from the toxic state. The average time of death in the cases in recent years has been in about five days. This article discusses early treatment under the heading of local and general therapy. The author is interested in describing only one form of therapy which to him is known to be good and which can be used under present-day standards. The material used for local application satisfies reasonably well the desirable features; it may be a cream, jelly, or ointment; or this is used with an occlusive pressure dressing, such as described by Koch, Ackman, Wilson, and others.

The advantages of an ointment, cream, or jelly are many. Those of particular importance are listed:

1. It is easy to apply, both for medical and nonmedical personnel.
2. It needs no elaborate paraphernalia in its employment.
3. It can be packaged in sterile fashion in suitable containers.
4. It can be combined with gauze mesh in the original packaging; this eliminates one maneuver in the primary dressing.
5. According to the medicaments it contains, it can be made available in large supply.
6. Ointments can be made, which after wide variation in temperature return to the original composition and texture.
7. It can be applied quickly.
8. A repeat application is not necessary and can be definitive if circumstances demand.
9. Nursing-care requirements are at a minimum. Ointments vary much and the base used appears important. Maceration must be prevented, and miscible creams and jellies are less likely to cause it.

The problem of infection is best managed by prevention of initial contamination, rather than by bringing infection under control later. Topical sulfonamides may be of considerable help.

When an ointment or cream is put on a burned surface, it should be spread easily and adhere to that surface. Many unguents must be applied to or impregnated in gauze. The mesh of the gauze should be fine if applied to granulation tissue. The local application should overlap the limits of the burned area considerably. It is padded by sterile fluffed gauze or machinists' waste. Firm bandaging with pressure reinforced by adhesive plaster fixes the dressing. Enough padding is used to absorb considerable exudate. The pressure is designed to check the "bleeding" of the plasma into the tissues adjacent to the surface lesion and thus control local edema. The local application, if and when it represents the definite local treatment, should not be removed for a week.

The author believes that débridement is an important step; sterile soft soap and a detergent should be used if necessary. The débridement consists in removal of any portion of the skin that is loose or raised in blebs.

General therapy consists in the control of pain with morphine and general supportive measures. Plasma must be given to prevent hemoconcentration and to restore blood volume. Burns of 10 per cent of the surface or more demand treatment of this type. In children, the basis should be 3 cc. of plasma per 1 per cent rise in hemoglobin per 10 lb. of body weight.

Early complications may be mild jaundice, vomitus containing blood, uremia and anuria, and chest complications such as emphysema, pneumonia, and acute pulmonary edema.

LEROY J. KLEINSASSER, M.D.

Ackman, D., Gerrie, J. W., Pritchard, J. E., and Mills, E. S.: A Report on the Management of Burns. *Ann. Surg.*, 1944, 119: 161.

In a previous communication, the authors reviewed the problem of the treatment of burns and stated their conception of the principles involved, the most important principle being that burns are large wounds and should be so treated. The authors suggested that treatment be timed to anticipate complications and sequelae, and on this basis they developed their outline of management:

TIMING IN THE TREATMENT OF BURNS

General Measures: To anticipate and prevent shock, toxemia, and infection with death, sepsis, and inanition:

1. Retention of body heat by a burn tent or other measure
2. Prevention of pain by adequate sedation
3. Control of hemoconcentration and other blood changes by the regulated use of blood, plasma, and serum
4. Controlled administration of fluids and the necessary amount of carbohydrate and protein food either by infusion or by mouth
5. Specific antisera, as antitetanic and antigas
6. Gentle handling to avoid pain and fatigue
7. Delay in carrying out any local treatment until antishock measures are at least well advanced, and control in view (This rule is operative in the treatment of all wounds. If necessary, local treatment already commenced should be interrupted if signs of shock recur.)

8. Avoidance of anesthetics whenever possible to prevent further shock and depression

9. Promotion of renal output by adequate fluids administered by vein or mouth

Local Measures: To anticipate and prevent infection and maiming, with disability or death, and, conversely, to promote rapid healing:

1. Gentle surgical wound cleansing with soap and water, saline solution, and, when necessary, some other detergent

2. Removal of debris, and surgical excision of dead and devitalized tissues (This includes the opening of blebs.)

3. Employment of occlusive bulky pressure dressings, infrequently changed, to promote:
   (a) Rest by immobilization, resulting in lymphstasis
   (b) Prevention of bacterial contamination by exclusion
   (c) Pressure (1) to prevent edema and thereby improve the circulation of the blood; (2) to minimize the lymphatic flow
   (d) Drainage of discharge from the burned surface into the bulky absorptive dressing
   (e) Bacteriostasis: (1) autogenous, (2) bacteriostatic sulfonamides*

4. Employment of the earliest possible skin grafting
   (a) Primary, when possible, though rarely practicable
   (b) Delayed primary as the common practice
   (c) Secondary, when made necessary by very deep and extensive burns or by delay for some special reason
   (d) Homografts when necessary to save life or minimize inanition

The present report reviews two years' experience with more than 200 major and minor burns treated according to this plan, and 100 major burns requiring hospitalization were analyzed. The other cases were treated as out-patients, and equally satisfactory results were obtained with less control. The hospital cases were classified as to (1) area involved, (2) depth, and (3) results of treatment.

The burn history and the clinical appearance of the lesion are the most reliable guides as to depth and probable necessity of skin grafting. The extent is calculated and recorded according to Berkow's table. Burn depth is classified as superficial and deep, the latter requiring skin grafting.

Cross infection did not occur and the streptococcus pyogenes, bacillus pyocyaneus, and bacillus proteus have been absent when sulfathiazole occlusive dressings have been used. Skin grafting should be done before granulations appear, but if present they are no serious contraindication, provided they are removed. The Padgett dermatome is used, and the thicker skin of the back or loins is preferred. The donor sites are dressed in the same manner as the burn. Grafting is done at the first, second, or third dressing, usually the first, from the tenth to the fourteenth day. The burn area is not especially prepared other than by the removal of the dressing and by whatever débridement is necessary.

Isodermal grafting may be used in selected cases in infants and the possibilities of fetal skin and fetal skin banks are suggested. Small deep burns not extensive enough to require grafting were also treated by multiple infrequent pressure dressings with sulfathiazole emulsion and changed at intervals of from seven to fourteen days. The results in this group were good, the average healing time being twenty-four days. Infected superficial burns, improperly or inadequately managed and arriving at the hospital on an average of five days after trauma, were treated in the same manner. In all but 2 cases, a single compression dressing produced control of the infection and healing. Sulfonamides were not given orally and saline baths and other local therapy were thought to be unnecessary. Thirty-three patients suffering from superficial burns involving over 10 per cent of the body surface were treated on an average of one hour after injury. These cases were judged to be contaminated but not infected. The average burn area was 20 per cent and 6 were between 25 and 30 per cent. Most of the patients were in sufficient shock to require antishock therapy. Under the treatment outlined, nearly all responded well enough to permit the discontinuation of plasma after twenty-four hours. One of this group died. Such cases are considered as severe wounds and necessary antishock measures are indicated before dressings are applied. Again in this group, a single dressing was sufficient and oral sulfonamides were not administered.

The scrotum, labia, anal region, and perineum do not lend themselves to the application of satisfactory compression dressings. In burns of these areas sulfathiazole emulsion has been used; it is placed on gauze dressings which are held in place by T-binders and changed when necessary. Eschar therapy has been eliminated because it definitely obstructs the plan for early grafting of the deep burns and causes delay in healing of the superficial burns. The compression dressing has given better results and the authors hold that eschar therapy has now no recognized place in burn management.

The frequency of dressing depends upon burn depth and whether grafting is anticipated. In superficial burns, a single dressing for a week is sufficient. In the deeper burns it is unnecessary to change the dressing earlier than between the tenth and fourteenth days when débridement is carried out and grafting commenced at once. Burns of the face are adaptable to compression dressings, and when they are used there is less edema and more prompt healing.

The anticipation of impending shock and its immediate treatment are of paramount importance in burn therapy. While hemoconcentration due to plasma loss occurs in extensive burns, the series

*A 5 per cent oil-in-water emulsion of sulfathiazole (M.G.H. formula[1]) has been used almost exclusively for this series.

analyzed shows that other factors may at least contribute toward it. A case is cited in which there was a 32 per cent burn in a nine-year-old boy. Six hours after trauma, while the patient was in obvious shock, the hemoglobin, red count, and hematocrit were within normal limits. Three hours later, the hemoglobin was still within normal limits although the hematocrit had risen to 59 per cent. It is believed that in this case the shock was aggravated by prolonged débridement. Caution should be exercised in the too liberal use of plasma when hemoconcentration is absent, since edema of the lungs, liver, and kidneys may result. In extensively burned patients determinations of the plasma protein, hemoglobin, and hematocrit should be made every two hours during the initial period and later if shock is imminent. Therapy should be directed toward the actual abnormalities in each case, and the amounts of plasma should be administered on the basis of loss and the promptness of response. The administration of electrolytes for the patients in shock has been restricted to the use of from 5 to 10 per cent glucose solution to prevent edema. Normal saline solution is used only to overcome specific blood-chloride loss. The authors believe that the oral use of sulfonamides carries an unnecessary risk to the liver and kidneys. Anemia and hypoproteinemia must be managed by replacement. Transfusion of whole blood after the initial period is indicated; the amount being determined by clinical laboratory studies. Blaud's mass (4 gm. daily) is well tolerated after initial shock. Hypoproteinemia is corrected by the oral administration of protein. High protein feeding is used in the later stages. When this method is insufficient, intravenous amino-acid preparations should be used. Here again, frequent clinical laboratory estimations are necessary.

With regard to burn toxemia, it is suggested that this unsolved problem deserves further study and is probably the remaining major problem in the burn patient.

BENJAMIN GOLDMAN, M.D.

Siler, V. E.: The Management of Heat Burns. *J. Am. M. Ass.*, 1944, 124: 486.

There are two fundamental points of approach to burn therapy: (1) general treatment of the patient, and (2) the definitive treatment of the burned area. General treatment is the most important and is divided into immediate first-aid measures and hospital treatment. Under first-aid are included such measures as keeping the patient warm and administering fluids and analgesics. Locally, the application of dry clean sheets or towels, or sterile dressings is preferred to various home remedies. At the hospital all persons connected with the patient should be capped and masked in an effort to lessen secondary contamination of the burn surface. The history should be brief but accurate and the physical examination the same. Laboratory studies should be started at once. Morphine should be given in doses needed to control pain. Thermal shock should be anticipated, and prevented by the administration of blood plasma. Hematocrit and plasma-protein determinations are valuable aids in the guidance of fluid therapy. Oxygen may be beneficial in extensive burns. Local sulfonamide therapy has not prevented or lowered the incidence of infection. Siler finds sulfadiazine, when administered systemically, to be effective and helpful. Urinary complications must be watched for during the period of chemotherapy.

Only after general therapeutic measures have been started should local therapy be considered. Although there is some controversy as to the best local treatment, "the tendency at present is to utilize a method which does not add further injury to an already injured patient, and which at the same time is relatively simple, protects the injured area, allows minimal plasma loss from the wound, promotes comfort and ease in handling the patient, and, above all, one which affords rapid epithelization or which promotes early grafting of third-degree wounds." It would appear that the "primary cleansing compression and rest treatment of burns" originating with Koch and Siler more nearly approximates the desired effect than any other treatment of choice. The method is described in detail in the article.

EDWIN J. PULASKI, M.D.

Hamilton, J. E.: Epithelization as Affected by Nickel Pectinate and Other Agents. *Surgery*, 1944, 15: 242.

In a period of four years, 65 wounds in 61 patients were dressed with nickel pectinate. As controls, 34 comparable wounds in 31 patients were treated with various bland agents, chiefly cod-liver oil or ointment. In addition, controlled wound-healing experiments were carried out in 6 rabbits.

In 22 cases, larger wounds, nearly uniform throughout, were divided into two comparable areas, the one dressed with the experimental agent, the other with the control.

The author has found that nickel pectinate does not promote wound healing, but, instead, depresses granulation-tissue proliferation.

Nickel pectinate indirectly exerts a definite acceleration of epithelization by virtue of its depressant effect on excessive granulation tissue. Hence, it is contraindicated in the early stages of wound healing, but it is an ideal dressing where epithelization is sought.

Nickel pectinate is mildly antiseptic. It is hemostatic by virtue of the fact that it condenses and renders less vascular the granulation tissue with which it comes in contact.

HAROLD C. OCHSNER, M.D.

Held, I. W., and Busch, I.: The Skin as a Source of Systemic Infection. *Am. J. Surg.*, 1944, 63: 47.

The authors call attention to the importance of minor and major skin infections in the causation of sepsis. When the skin serves as a portal of entry for bacteria its continuity has been interrupted, as by trauma or by various dermatoses. Two groups of organisms may gain entry through the skin and

cause sepsis. Septicemia is caused most often by the staphylococci, less often by the streptococci, and occasionally by the gas-gangrene group of organisms. The toxin-producing organisms are represented mainly by the bacillus tetani and the bacillus anthracis.

Staphylococcic sepsis, in which the portal of entry has been through the skin, is divided into 5 groups:

1. Slight or no visible injury of the skin with fulminating fatal sepsis. This form is often called cryptogenetic, and is associated with complete lack of immunity.

2. A demonstrable local lesion, the removal of which prevents fatal sepsis. A case is cited of a girl who developed a blood-stream infection associated with an infected finger. Amputation and supportive therapy resulted in complete recovery.

3. A local focus of the skin with minimal local symptoms causing invasion of the lungs. A case is presented of a minor toe infection, followed, two weeks after subsidence, by staphylococcic sepsis with lung involvement and gradual recovery.

4. Secondary invasion of the endocardium. This is the most serious complication of staphylococcic infection of the skin and it nearly always terminates fatally.

5. Sepsis from a reactivated dormant focus. Typical of this group are the staphylococcic carbuncles of the kidney occurring weeks or months after a minor skin infection, and the acute osteomyelitis of children or young adults.

Streptococcic sepsis originating from the skin is rare. Minor hair-follicle infections, streptococcic furuncles or carbuncles, or streptococcic infections of a punctured wound of the skin are the most common causes. Since the introduction of the sulfa drugs, the management of this type of sepsis has been very encouraging and a marked reduction in mortality has resulted.

The authors point out that the prophylactic treatment of tetanus by active immunization has yielded excellent results, so that in the armed forces, where active immunization is practiced, the disease has all but disappeared.

The symptomatology, diagnosis, and the authors' method of treatment of gas gangrene and anthrax are described. EDWIN J. PULASKI, M.D.

Florey, M. E., and Williams, R. E. O.: Hand Infections Treated with Penicillin. *Lancet*, Lond., 1944, 246: 73.

To ascertain more fully the possibilities of using penicillin in acute pyogenic infections, a careful study has been made of 212 cases of acute infection, chiefly about the hand. About one-half of these infections were treated by ordinary methods; the other half were treated with penicillin applied locally, in addition to the usual surgical procedures. The cases were grouped according to the site of the infection, as shown in the table.

Group	No. of Cases: Control series	No. of Cases: Penicillin series
1. Paronychia	26	26
2. Pulp infection	27	28
3. Web-space infection	9	9
4. Tendon-sheath infection	11	11
5. Miscellaneous abscesses	12	12
6. Septic lacerations	5	6
7. Miscellaneous lesions	12	18
	102	110

The great majority of control cases remained septic for well over a week, and nearly three-fourths were infected until the wounds healed. In the penicillin-treated series, given adequate access and removal of dead tissue, sepsis (as judged by clinical and bacteriological criteria) was eliminated within a week. In the latter group, pus was scanty and often absent from the time of operation. Relief of pain and throbbing, as well as improvement in the general condition, have been striking, and penicillin has effected a great saving in the number of dressings.

In cases in which the infection involved bone, penicillin treatment led to rapid rarefaction with improvement in the clinical condition. Regeneration of the bony tissue took place readily.

The rapid return of the infected parts to mobility was one of the most striking features of the penicillin series.

Some patients complained of burning when the dry, impure calcium salt was used on wound surfaces not protected by granulation tissue. Penicillin proved of value in the preparation of infected surfaces for skin grafts and infected stumps for amputation, and for the complete healing of chronic dermatitis. The total amount of penicillin used to treat over 100 cases was not more than 500,000 units. HAROLD C. OCHSNER, M.D.

Siler, V. E.: The Management of Injuries and Infections of the Upper Extremities. *J. Am. M. Ass.*, 1944, 124: 408.

It is important to examine wounds of the hands carefully in order to determine their nature and the extent of the trauma, especially to tendons, nerves, or blood vessels. Furthermore, a careful examination of the motor and sensory function of the nerves of the forearm must be made.

There is no excess of tissue in the human hand. Therefore conservation of tissue is a principle which must be followed in cleansing, débridement, and suture of an injury.

Tendon injuries should be sutured in an operating room under strict aseptic conditions. Suture should be done with silk within three hours after the injury is sustained. No motion is allowed until fourteen days after operation.

Heat burns of the hand and forearm respond well to primary cleansing, compression, and rest.

Human bites are serious trauma and lead to serious infections. Human-bite injuries which are more than three hours old should be treated as open wounds.

Tenosynovitis is the most feared of all inflammatory processes as the function of the hand disappears rapidly with this lesion. Operation should always be done under general anesthesia. The finger should be opened on the lateral aspect in a bloodless field. Complications from this infection may be abscesses of the fascial spaces of the hand. When these spaces become infected, adequate incision and drainage are the only treatment of choice.

HOWARD A. MCKNIGHT, M.D.

Iland, C. N.: Phemeride: A New Antiseptic Detergent. *Lancet*, Lond., 1944, 246: 49.

Phemeride (marketed in the United States under the trade name of phemerol) is a quaternary ammonium compound containing a long aliphatic chain. It is a cationic detergent which is effective particularly against Gram-positive organisms. Its mode of action seems to be a disruption of or interference with the bacteria cell membrane. Its bacteriostatic and bactericidal actions were studied and the conclusions were drawn that phemeride could be used in concentrations which, while inhibitory to common pathogens, are not damaging to the tissues. When compared with cetavlon under the same conditions, phemeride was twice as strong in action.

Phemeride appears to have good bactericidal properties, and is nontoxic to the tissues in strengths effective against many pathogenic bacteria. It can be placed in open wounds and in the pleural cavity without apparent damage. It is an efficient skin disinfectant.

STEPHEN A. ZIEMAN, M.D.

Tate, B. C., and Klorfajn, I.: Sulfonamide Dermatitis: Sensitization from Local Application. *Lancet*, Lond., 1944, 246: 39.

Sulfonamide dermatitis may be regarded as an epidermal sensitization characterized by an eczematous reaction and caused by contact of the skin with sulfonamide paste, powder, or ointment.

In the authors' cases, the eruption involved the usual skin-sensitive areas, or appeared only at the site of application. The severity of the eczematoid reaction depended on the duration of the local therapy. In 21 cases, the interval between the appearance of the dermatitis and the beginning of treatment varied from four to fourteen days. Topical applications of sulfanilamide and of sulfapyridine were the most frequent causes of dermatitis. The patch test was usually positive, especially when applied to the scarified skin. In 2 patients the patch test was positive only in the area of topical application. In 3 patients with negative patch tests, the ingestion of sulfonamides caused the appearance of eczematoid eruptions. Nonspecific irritation, as from adhesive strappings and chronic sun tan, sensitized the skin to sulfonamides and resulted in eczematoid manifestations. Patients with skin sensitivity to any one of the sulfonamides exhibited group sensitivity to all the other related drugs. However, sulfadiazine and the newer drugs were not tested.

Incomplete follow-up studies of these patients indicated that skin sensitization was a permanent characteristic. Many of these individuals were found to be allergic to sunlight. Likewise, chronic exposure to sun enhanced the susceptibility to sensitization and dermatitis. This was characteristically frequent in Middle East troops.

Treatment of sulfonamide dermatitis with Lassar's paste and a lead and calamine lotion quickly effected a cure of the local lesion. Topical sulfonamide applications must be stopped. Desensitization may be tried by the oral administration of the sulfonamides, the dose beginning with 1/500 gr. Usually an eczematoid reaction followed the ingestion of 1/250 gr., but the desensitization was continued despite the progressive severity of the skin reaction. A total of 22 gm. of sulfonamide seemed to be necessary for desensitization, which was recognized by the disappearance of the skin lesion and a negative patch test. Fourteen patients have already been desensitized by this method. However, desensitization has not as yet been proved, and the method was attended by some danger.

BENJAMIN G. P. SHAFIROFF, M. D.

ANESTHESIA

Hershey, S. G., and Apogi, E.: The Anesthetic Management of Aged Patients with Fractured Neck of the Femur. *N. York State J. M.*, 1944, 44: 183.

Hershey and Apogi draw attention to the increase in life expectancy in the past forty years, and to the fact that in 1940 the age of 6.8 per cent of the population was sixty-five years or over. It is pointed out that a more careful surgical consideration of this group of patients is indicated.

The field of surgery has expanded in the sixth and seventh decades, so that at present the operative treatment of fracture of the femur is considered one of the more common procedures. The anesthetic management of aged patients with fracture of the femur is a prime factor in recovery, and the anesthetist must provide for (a) relief of pain, (b) protection against uncomfortable positions and restlessness, (c) adequate muscular relaxation, (d) maintenance of normal physiological functions, and (e) the possibility of explosions with x-ray apparatus. Successful anesthetic management includes also the establishment of fluid-electrolyte balance and the treatment of shock, and both the cardiac and renal status must be accurately appraised and properly handled.

The advantages and disadvantages of the various anesthetics are discussed, and preoperative sedation is emphasized. In the authors' series of 173 cases, the death rate for all types of anesthesia was 6.3 per cent; for those cases in which operation was done with inhalation anesthesia the death rate was 3.7 per cent.

No deaths occurred in the operating room.

BENJAMIN GOLDMAN, M.D.

Evans, F.: Continuous Intravenous Adrenaline in Spinal Anesthesia for the Control of the Blood-Pressure. *Lancet*, Lond., 1944, 246: 15.

To obviate the fall of blood pressure noted in cases of high spinal anesthesia (as far as the nipple line), a very dilute solution (1-250,000) of adrenaline in normal saline solution is employed; 2 cc. of 1:100 adrenaline are added to 500 cc. of normal saline solution in a vacoliter and intravenous administration is started after the spinal anesthetic is introduced. Using from 20 to 70 drops per minute, the author was able to maintain the blood pressure at safe levels in varying types of severe abdominal operations. The only complications noted were an excessive rise of the blood pressure in 1 case and cardiac irregularity in cases of overdosage.

JOHN WILTSIE EPTON, M.D.

Lyons, H., and Hanse, F. M., Jr.: Continuous Caudal Anesthesia in 200 Obstetric Patients. *Am. J. Obst.*, 1944, 47: 105.

Continuous caudal anesthesia was employed in 200 consecutive obstetric patients and satisfactory results were obtained in 195 instances. No obstetric complications which could be considered as contraindications to the use of this procedure were encountered by the authors.

The most important complications to look out for are the intravenous or subarachnoid injection of the drug, infection, breaking of the needle, fall in the blood pressure, toxic manifestations, and trauma to the sacrum. An increase in the number of operative deliveries was observed.

EDWARD L. CORNELL, M.D.

Spitzer, W.: Obstetric Analgesia with Pethidine. *Brit. M. J.*, 1944, 1: 179.

Pethidine hydrochloride was studied for its analgesic and spasmolytic effect on 80 normal mothers. About 17.5 per cent were greatly relieved, 75.5 per cent had good relief, and 10 per cent had no relief.

For reasons of safety the oral route of administration was used in this series. The effect of the administration of a 25 mgm. dose appeared in from twenty to thirty minutes and lasted from one to four hours. The optimum pain response seemed to occur with a 25-mgm. dose repeated half-hourly for 2 doses.

Pethidine has no objectionable accompanying effects on mother or baby. In 3 mothers transient vomiting and bradycardia were noted and 5 babies showed a mild degree of asphyxia.

It was found that the progress of labor was not delayed; in fact, pethidine had a remarkable shortening effect on the duration of normal labor, possibly because of its direct relaxing action on the uterine cervix.

HOWARD A. MCKNIGHT, M.D.

Schumann, W. R.: Demerol (S-140) and Scopolamine in Labor. *Am. J. Obst.*, 1944, 47: 93.

Demerol and scopolamine were used in a series of 1,000 cases for the purpose of studying the maternal and fetal effects of this combination when it is used as an obstetrical analgesic. Because the primary purpose in medication is to establish complete amnesia, the author incorporates scopolamine in his routine as the drug of choice. Demerol is used to obtain psychic sedation through its analgesic effect; this secures a favorable background for the action of scopolamine, reduces the excitement, and enhances the amnesia.

The uncorrected incidence of satisfactory amnesia is 70.5 per cent, if satisfactory amnesia is taken to mean either absolute amnesia, or, at most, the recollection of two or three isolated incidents in which no pain is recalled. If this figure is corrected for cases receiving medication either too late, or so infrequently as to nullify the therapeutic effect, the incidence of satisfactory amnesia rises statistically to 90.4 per cent. It is the author's opinion that while demerol possesses other properties that make it more desirable than the barbiturates for purposes of obstetrical analgesia, it falls slightly short of the barbiturates in providing the most satisfactory amnesia.

The average primiparous labor in this series took twelve and four-tenths hours and the average multiparous labor, seven and six-tenths hours. This is a reduction of two and five-tenths hours in the primiparous and of one and two-tenths hours in the multiparous labor, when compared with a series of 500 patients who received barbiturate analgesia.

For preanesthetic medication, demerol is not surpassed by the other preanesthetic combinations in common use. The amount of anesthetic agent required is approximately the same as the amount used in the patients receiving barbiturates. In this series of cases, there were no major pulmonary complications.

The intravenous administration of demerol was employed in patients admitted to the hospital in active labor, and who were expected to deliver within two hours. It was used also for premedication in cesarean sections. The incidence of satisfactory amnesia is shown to be approximately the same as in the patients receiving intramuscular medication, despite the fact that 63 per cent of the patients were medicated for less than one hour. No increased hazard was demonstrated in association with administration by the intravenous route.

The only maternal untoward effects in the series were seen in the group of patients who had received demerol intravenously. With the exception of transient nausea in one-fourth of the cases, no further side effects were seen when the drug was administered slowly; i.e., a minimal two minutes by the clock for the injection of 2 cc. (100 mgm.).

The analgesic properties of demerol are demonstrated by a series of 37 patients delivered without anesthesia, of whom 79 per cent could recall no pain whatsoever.

Demerol exerts no demonstrable depressant effect on either full-term or premature infants, whether it is administered by the intramuscular or the intravenous route.

In view of the satisfactory amnesia, the absence of pulmonary complications, and the freedom from depressant effect on the fetus, it is the author's opinion that demerol in conjunction with scopolamine is superior as an obstetrical analgesic to other analgesics in common use. EDWARD L. CORNELL, M.D.

Richards, V.: Refrigeration Anesthesia in Surgery. *Ann. Surg.*, 1944, 119: 178.

Refrigeration anesthesia for surgery of the lower extremity was first developed by Allen in 1941 and he reported that it was particularly suitable for diabetic and arteriosclerotic gangrenous legs requiring amputation. Richards reports 2 interesting experiences with refrigeration anesthesia in an attempt to appraise some of its more debatable aspects.

The first patient was a white female aged fifty-two with an embolic occlusion of the left femoral artery. Under 1 per cent novocain anesthesia an embolus was removed. The common femoral artery was not ligated. By the fifth day circulation was not restored and it was decided to refrigerate the part to preserve the limb while collateral circulation was becoming established. From July 22 to August 5, 1942, refrigeration was induced and amputation was done on August 5. Ten days after the operation the wound had failed to close and fifteen days after the wound had not healed by secondary closure. The patient died August 27 either from acute heart failure or pulmonary embolism. Autopsy was not done.

The author points out that although the cooling had retarded the metabolic needs of the tissues and prevented gross necrosis, it did not prevent gangrene. It apparently caused the collateral blood supply to contract and retarded the stimulus for and the rate of growth of the new channels.

The second case was that of a white male aged seventy who complained of severe pain in the left foot. The femoral pulse was barely palpable and the pulsation of its branches below were absent. Pain was severe enough to make the patient insist upon amputation. He was advised that the pain might be relieved by section of the peroneal and sural nerves. Refrigeration anesthesia was employed in an attempt to demonstrate by surgical biopsy of nerve, muscle, skin, and subcutaneous tissues the microscopic alteration that was possible in tissues subjected to cold. The question was raised as to whether refrigeration would have any permanent untoward effects on the foot after it had been allowed to return slowly to room temperature. The patient consented to the proposal provided that amputation would be done if the results were not satisfactory. The operation was done after application of the Allen technique, and after the operation the extremity was allowed to warm up slowly in the following four days. Excrutiating pain returned to the leg after two days, although there was complete anesthesia over the area distributed by the sectioned nerves. One day after all of the ice bags had been removed, the toes became blue and mottled and on the fifth day midthigh amputation was performed under gas anesthesia. The author believes that this is the first reported case in which a limb was actually refrigerated and then allowed to return slowly to room temperature. It is doubtful that refrigeration anesthesia may be used successfully in reconstruction operations on normal limbs as once a tourniquet is applied, irreversible tissue changes are apt to occur.

The technique of refrigeration anesthesia is described. Postoperatively the usual pressure dressings and immobilization of the stump are the rule. The stump is covered with ice bags which are decreased in the next forty-eight to seventy-two hours. Sutures, if used, should not be removed before the tenth to twelfth day. Pneumonia is a definite complication, particularly in the elderly toxic group. Precautionary measures to avoid this complication should be employed.

Richards concludes that after an analysis of the clinical and experimental material, many of the advocated advantages of refrigeration in the treatment of shock, infection, traumatic vascular occlusion, and reconstructive extremity surgery seem untenable. While bacterial growth may be retarded, so is the tissue response to inflammation, and on release of the cooling, the inflammatory reaction may be aggravated. In an injured extremity with an intact blood supply the application of a tourniquet is hazardous because it increases subsequent shock by adding trauma to the effects of tissue asphyxia.

Refrigeration anesthesia is advantageous in the control of shock, hemorrhage, and infection if amputation is essential. This has been demonstrated in elderly debilitated patients suffering from gangrene or infection. This method then eliminates absorption of the toxins, and permits amputation in a bloodless, shockless, and completely anesthetic field. This is the main advantage of refrigeration anesthesia. Pneumonia must be cautiously avoided after operation. BENJAMIN GOLDMAN, M.D.

Falls, H. F.: A Word of Caution in the Use of Pentothal Sodium in Ophthalmic Surgery. *Arch. Ophth.*, Chic., 1944, 31: 134.

Pentothal sodium is a barbiturate and, as such, is endowed with considerable variability of action. Among the chief effects of the intravenous administration of the drug is depression of the respiratory center in the medulla.

The lack of adequate signs of impending respiratory failure makes the margin of safety too narrow to permit the unqualified use of pentothal sodium.

The 1 case of death and the 7 instances of severe apnea reported in this article are attributable to errors of technique, but serve to emphasize how dangerous this complication may be.

From the standpoint of the ophthalmic surgeon, many of the postoperative sequelae of the administration of pentothal sodium are extremely serious. Restlessness, nausea, and vomiting are certainly dangerous when they follow an intraocular operation.

The rather frequent long periods of reaction which follow the use of large amounts of pentothal sodium

require the careful supervision of both the physician and the nurse so that prompt resuscitative measures can be taken when indicated. J. M. MORA, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Dahlberg, A. A.: Treatment of the Lip and Cheek in Cases of Facial Paralysis. *J. Am. M. Ass.*, 1944, 124: 503.

A new simple method of supporting the lip and cheek in cases of Bell's palsy, or facial paralysis, has been found to be successful in a number of instances. It is necessary to give this support to prevent the droop and loss of tone that is so characteristic of these tissues in facial paralysis.

The method consists in cradling the lip and cheek in a translucent plastic support and connecting that support by rubber-band tension to a metal hook that is fastened to the last upper molar on the affected side.

Technical features of the preparation of the apparatus and its attachment to the tooth are described clearly.

This method of lip and cheek support offers several advantages over other methods. It eliminates the conspicuousness which is so striking when adhesive tape or ear attachments and vulcanite are used. The translucent cradle is not very noticeable. The discomfort of traction over an ear and the messiness of adhesive tape are done away with. The device, once established, is easy to apply and use. It also gives better control of the tissues than do the other methods. Most important of all, the patient will use this appliance consistently at all times, whereas he did not do so with the others. Use of the device should be maintained until normal function of the muscles returns. JOHN E. KIRKPATRICK, M.D.

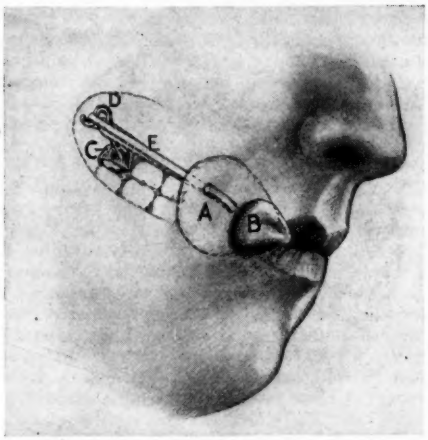


Fig. 1. Diagrammatic view of appliances for supporting the lip and cheek. A is the flange of the cradle inside of the cheek and B the outer flange. This pulls the lip under traction from the rubber band, E, which is attached to the hook, D, on the gold band, C.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Huber, F.: Cholecystography and Jaundice. *Am. J. Roentg.*, 1944, 51: 12.

Review of the literature reveals a surprising divergence of opinion as to the safety and value of cholecystography in patients with jaundice.

The findings and conclusions of numerous workers are cited by the author, and his own experience with 50 unselected cases of jaundice examined by cholecystography is presented. The individual cases are tabulated as to age, sex, diagnosis, degree of jaundice, and cholecystographic findings. The findings in connection with various groups of lesions are also given consideration.

In his discussion the author states that from a practical point of view the entire situation resolves itself into an attempt to distinguish between surgical and medical cases of jaundice. This was possible to a large extent in the 36 cases in which jaundice was decreasing. Since a patent common duct is here predicated, the same diagnostic criteria are used as in patients without jaundice. With increasing jaundice, however, (the remaining 14 cases), diagnostic information is usually not obtained since apparently no difference exists in the degree of impairment of dye excretion, whether due to back pressure (extrahepatic biliary obstruction) or due to parenchymatous disease, either toxic, infectious, cirrhotic, or neoplastic.

The following conclusions are reached: cholecystography in jaundice, while apparently not harmful, is of little or no differential value when jaundice is increasing, and it may well be deferred when jaundice is decreasing. A. HARTUNG, M.D.

Buschke, F., and Cantril, S. T.: The Course of Postoperative Parotitis under Radiation Therapy. *West. J. Surg.*, 1944, 52: 21.

The successful treatment of postoperative parotitis by means of radium or roentgen rays has reduced the high mortality rate of this otherwise formidable complication to practically nil. The authors publish the results of a series of 26 cases treated with roentgen rays and compare them with the results of other investigators, such as Costolow *et al* in a series of 42 cases treated with radium, Fricke-Madding in a series of 111 cases treated likewise with radium, and Pendergrass-Hodes in a series of 47 cases treated with roentgen rays.

The percentage of results was remarkably uniform in all series. From 68 to 75 per cent of the cases treated showed a regression of the parotitis without suppuration. In 15 per cent, recovery followed surgical drainage or spontaneous perforation. Between 11 and 17 per cent of the patients died while the parotitis was uncontrolled, although in only a few, if any, could death be attributed to the parotitis.

Similarly, a bedside observation of the treated individual cases showed a very uniform clinical course. Following an occasional increase of pain and a rise of temperature for a few hours, there was a lytic decrease of temperature with striking clinical improvement within from twenty-four to forty-eight hours. The general aspect of such a patient was that he had passed the danger point. This was indicated by the rather sudden cessation of severe general intoxication. By co-ordinating this behavior with the experimental findings of Bisgard and his coworkers, the authors believe that the action of irradiation was twofold: it produced an antitoxic substance which counteracted the toxemia and, in addition, had a local effect similar to that observed in other localized infections, such as furuncles. In the majority of instances a slow disappearance of the parotid gland, without suppuration, followed.

In a minority of cases, suppuration occurred. The authors are concerned mainly with the reasons for this. They admit that for the time being there is no satisfactory explanation for the variation in the clinical response of apparently the same type of lesion. Inadequate drainage with the development of a marked edema of Stenson's duct may be one of the contributing factors; the difference of the causative micro-organism may be another, although the majority of cases were of staphylococcic origin; and the varying degree of virulence may be still another contributing factor. Worthy of note in the authors' series is the fact that all cases which presented suppuration had received sulfonamides in addition to the radiation therapy. This is of interest because of the controversy initiated by Kelly regarding the possible antagonism between the sulfonamides and radiation therapy in infections.

The authors do not feel justified to draw final conclusions as yet, but they are definitely under the impression that the treatment of parotitis by radiation therapy alone is sufficient, and that the additional administration of sulfonamides only serves to deteriorate considerably the general condition of the patient and prolong the time of severe morbidity beyond that seen in cases in which radiation therapy alone has been given. T. LEUCUTIA, M.D.

Rosh, R., and Quinn, W. P.: Roentgen Rays in the Treatment of Cervical Lymphadenitis. *Radiology*, 1943, 41: 464.

Since the advent of roentgen therapy, in 1898, in the treatment of tuberculous lymph glands, radical surgery has become a rarity.

Tuberculous cervical lymphadenitis is a chronic inflammatory process. Therefore, as in all inflammations, small doses are given. However, in planning the type of treatment, consideration must be given to the hereditary and economic background of the patient as well as to the extent of the lesion.

Lymph nodes are usually found in the posterior triangle of the neck; these nodes may be large and well outlined before caseating. In the early stages of the disease it is sometimes necessary to supplement the clinical finding with a chest film and biopsy of a lymph node in order to make a final diagnosis. If all findings are negative, a therapeutic course of roentgen therapy may prove of help in making the diagnosis.

Four hundred and nineteen patients were treated during the period from 1924 to 1941. Chest films of all cases confirmed the impression that parenchymal pulmonary tuberculosis and tuberculous cervical lymphadenitis are not concomitant. In 305 of the 419 cases, positive biopsies were obtained, and in 12, positive cultures were obtained with aspirated material from fluctuant nodes. The remaining 102 patients were treated following a clinical diagnosis of tuberculous lymphadenitis.

Treatments were individualized. Low or medium voltage was used: 100 roentgens per treatment at weekly intervals, or a total dose of from 600 to 800 roentgens was given. This was repeated, if necessary, in eight weeks.

Follow-up observations were available in 310 cases. Of these, 140 had received one course of therapy and the others, two or three courses. Active tuberculosis was found in 19 cases and minimal tuberculosis in 30; calcification had occurred in 109 cases, and no tuberculosis was found in 160. In 9 cases, tuberculosis became active during and after irradiation. It is thought that the pathological process may have been accelerated by the irradiation.

The end results in the 310 cases were: complete disappearance of the lesions in 178 cases; partial disappearance in 101; and slight improvement in 31.

MAURICE D. SACHS, M.D.

Widmann, B. P.: Roentgen Therapy for Bronchiogenic Cancer. *Am. J. Roentg.*, 1944, 51: 61.

The author reports a series of 167 cases of bronchiogenic cancer treated by radiation therapy, and makes comparison with another series of 119 cases which received no treatment. All cases were proved microscopically and in 53 per cent there was autopsy confirmation.

If no treatment was given, the patients died, as a rule, in less than a year. Of the irradiated patients, 18 lived from one to six years, which proved that roentgen therapy produces a definite prolongation of life in 10 per cent of the cases. Furthermore, 112 untreated patients, or 95 per cent, lived less than six months, as compared with 113 treated patients, or only 67 per cent, who survived less than six months, which suggests that also some palliation was obtained in the remainder of the series.

The technical procedure of irradiation varied considerably. In the main the following factors were used: 200 kv.; 0.5 or 2 mm. of copper; 50 cm. skin target distance; 1 to 4 fields over the chest anteriorly and an equal number posteriorly; size of fields, 6 by 8 cm., 10 by 10 cm., 15 by 20 cm., and 20 by 20 cm.; treatment every second day with 200 roentgens given to each of 1 to 4 fields on the same day. The tissue dose at the approximate tumor level was 2,500 roentgens in the majority of cases. A dose of 3,500 roentgens was contemplated, as a rule, but irradiation frequently had to be discontinued because of failing health and strength. Any treatment that exceeded 2,500 roentgens represented the total dosage of 2, 3, or 4 series given at six-, eight- and twelve-week intervals. It was noted that all of the 5 patients living two years or more received in excess of 6,000 roentgens, and the 1 patient still alive after six years received 8,400 roentgens. On the other hand, many patients who received doses of from 5,000 to 13,000 roentgens died within less than one year. Intrabronchial gold radon seeds were used in only 2 cases and external radium packs in 9 cases.

The conclusion is reached that the prognosis in bronchiogenic carcinoma continues to remain poor because of the advanced stage of the disease at which a correct diagnosis is made. Roentgen therapy offers unquestionable palliation and some prolongation of life, and therefore it should be administered with a dosage which is within the limits of cutaneous and physical tolerance.

T. LEUCUTIA, M.D.

McIntosh, H. C.: Roentgen Therapy of Pelvic Tuberculosis in the Female. *Radiology*, 1944, 42: 48.

In reviewing the literature on roentgen therapy of pelvic tuberculosis in the female, the author was impressed by the scantiness of publications in the American literature as compared to those of Continental Europe, and especially Germany. For example, Bickenbach, in writing a long and comprehensive article on the subject recently, was able to collect not less than 258 references, all but 21 of which were from the German literature. Perhaps some explanation may be gained from the fact that the incidence of female pelvic tuberculosis in the United States is extremely low. The author found at the Woman's Hospital of New York, in the years 1929 to 1942, inclusive, only 94 cases of pelvic tuberculosis in a total of 27,160 gynecological admissions.

In this article, the results obtained in 11 cases which were treated by radiation therapy are given. The cases are arranged tabularly to indicate the location of the disease, the method of diagnosis, the presence of other foci of tuberculosis, and the results of treatment up to a period of three years. The frequency of multiple foci is stressed. Six patients are free of disease from one to three years after irradiation; 4 showed definite improvement in their condition, although treatment was considered unsuccessful for various reasons; and 1 patient died six months later from pulmonary tuberculosis.

The various techniques of irradiation as found in the literature are considered. The author herself prefers, in contradistinction to other investigators, the smaller portals since the entire uterus and adnexa may be irradiated through a field of 16 by 12

cm. or less, and thus nausea and intestinal gas are obviated. Even in peritonitis it appears more advisable to divide the abdomen into several smaller fields than to irradiate it all at once. The dose amounted to 300 roentgens (in air) ten years ago, but now, following the general trend toward smaller doses, only from 75 to 100 roentgens are given. Treatment over the same field is repeated in one week, and over the different fields, from two to three times a week.

In conclusion, roentgen therapy is recommended in all adequately diagnosed cases of pelvic tuberculosis, although an association with surgical procedures often becomes necessary. Thus, grossly diseased tubes should be removed first and the pelvis irradiated postoperatively for the residual granulations. Endometrial involvement with minimal or no lesions of the tubes offers a good chance of success with irradiation alone. In dry peritonitis roentgen therapy is the method of choice, but in the presence of ascites, it is better to resort to surgical procedures first. In recurrences following operation, particularly effective results are obtained by the irradiation. T. LEUCUTIA, M.D.

Anderson, R. L., and Peterson, V. L.: Clinical Use of the Chamberlain Technique in Sacroiliac Conditions. *J. Am. M. Ass.*, 1944, 124: 269.

The usual roentgen examination does not permit visualization of motion in the sacroiliac joint because any such motion is in a direction which is not demonstrable thereby. Chamberlain demonstrated that this motion, when it occurs, is rotatory, and the rotation takes place within an axis which is perpendicular to the joint surface. The place to look for evidence of motion of the sacroiliac joint is at the symphysis pubis, where it is magnified and measurable. The technique used by Chamberlain to show motion aims to demonstrate it by special anterior projections of the pubis in the upright position with weight-bearing on alternate legs. The degree of motion is indicated by the amount of comparative overriding noted on the different exposures. According to Chamberlain, the normal movements range from no movement at all to 0.5 mm. in the male, and from no movement to 1.5 mm. in the nonpregnant female.

The authors studied 144 cases with somewhat obscure diagnoses, by means of the Chamberlain technique combined with the ordinary clinical tests that are used in low-back examinations. Detailed information concerning the cases, clinical and roentgen findings, and comparative studies of the two methods are presented.

Of the cases, involving 53 joints, in which x-ray measurements were made, 37 involving 46 joints showed slipping above the normal of 0.5 mm. in the male and of 1.5 mm., or more, in the female. Twenty-one of the 37 cases, or 56 per cent, presented positive sacroiliac signs and the x-ray examinations showed slipping on both sides. In a total of 26 of 37 cases, or 70 per cent, there was complete agreement between the x-ray and clinical findings. In 2 cases, or 5.4 per cent, the sacroiliac signs were positive on both sides and x-ray examinations showed slipping on one side only. In 2 cases the sacroiliac signs were positive on one side and the x-ray examinations showed slipping on both sides. In 5 cases, or 13.5 per cent, the sacroiliac signs were inconclusive and the x-ray examinations showed slipping on the same side. In 2 cases the sacroiliac signs were inconclusive and the x-ray examinations showed slipping on the opposite side.

The following conclusion was reached:

The so-called Chamberlain technique of x-ray examination of the sacroiliac joint is worth while and is accurate in from 70 to 80 per cent of the cases. It should be used in doubtful cases of sacroiliac-joint conditions. A. HARTUNG, M.D.

Hocker, A. F., and Guttman, R. J.: Three and One-Half Years' Experience with the 1,000 Kilovolt Roentgen-Therapy Unit at Memorial Hospital. *Am. J. Roentg.*, 1944, 51: 83.

This article represents an analysis of the records of 315 patients who had been treated for cancer with 1,000,000-volt roentgen irradiation since August, 1939. Although the treatments given were too recent to give conclusive findings, it was thought that such an analysis might be of value for comparison with lower voltage unit technique. Some details of the machine used are given, especially such as have contributed to the flexibility and accuracy of dosage.

The factors used were: 3 ma. current; filtration equal to a half-layer value of 3.8 mm. of lead; target-skin distance, 70 cm.; and intensity of the vertical beam, 50 roentgens per minute. The treatments were given in daily fractional doses of from 250 to 400 roentgens, measured in air. As a rule the patients tolerated them better than similar patients under the 200,000-volt machine. Roentgen sickness was less severe; it was not even a problem. With a few exceptions, the skin reaction from a total dose ranging from 2,100 to 5,000 roentgens per portal was not severe.

The patients treated are tabulated in groups as to the origin of their malignancy. In only 18 of them was the disease histologically unproved. Ninety-nine of them had received previous treatment, either surgical or radial. One hundred and forty-five of the number, for reasons which are mentioned, were considered unsuitable for judging the value of treatment.

The various groups treated are given separate consideration relative to special technique used for them. The survival rates are tabulated and illustrative case reports are included.

In their discussion the authors state that physical measurements show that at greater depth the higher voltage delivers a larger dose than is possible with the lower unit. Moreover, when small fields are used the increased depth dose becomes even greater since there is little scattered radiation. This advantage is decreased when the cross-fire technique is used with the higher voltage unit. The dose on the surface of exit somewhat offsets the practical value of the greater depth dose.

The million-volt unit, however, permits the use of a small field. This is an apparent advantage, for in the clinical application of roentgen irradiation a field should be used that will include the tumor in its entirety with as little of the surrounding normal tissue as possible. Another advantage is the relatively greater depth dose in the smaller fields in comparison to the dose obtained with the 200,000-volt machine.

The present analysis would seem to indicate, however, that the million-volt machine is not a substitute for the 200,000-volt unit as its use is limited to the treatment of deep-seated tumors.

A. HARTUNG, M.D.

Burrows, H., and Clarkson, J. R.: The Role of Inflammation in the Induction of Cancer by X-rays. *Brit. J. Radiol.*, 1943, 16: 381.

The occurrence of carcinoma of the hands after repeated x-ray exposures has long been a source of apprehension to the radiologist. Although it is a well known fact that repeated doses of x-rays may cause cancer, there has been some uncertainty as to whether a single dose of x-rays could cause cancer.

Burrows reported a case of carcinoma of the scalp which occurred eighteen years after the patient had received an epilation dose of x-rays for ringworm. Lacassagne and Vinzent, in 1929, showed that a single dose of x-rays could cause cancer in rabbits if the irradiated tissue were infected at the time of irradiation. (The dose was 600 roentgens). In 1933, Lacassagne induced sarcoma in rabbits by irradiating noninfective inflammatory tissue.

Since 600 roentgens is within the range of dosage which is constantly being given to human beings, the authors believe the subject to be worthy of further investigation. Rabbits were used in their experiments. The groin was inflamed by subcutaneous injections of 3 cc. of olive oil; four days later the injections were repeated with the addition of 2 per cent oleic acid; on the fifth day 7 cc. of a watery suspension of kaolin were injected; and on the eighth day the infected areas were irradiated with a single dose of 600 roentgens (250 kv., 4 ma., 0.5 mm. of copper filter, for approximately 23 minutes). Sarcoma appeared in 8 of the 9 rabbits treated. The earliest appearances of sarcoma were after twenty-two and twenty-three months in 2 rabbits, and in these there were no metastases. All the other rabbits showed metastases at death.

In a second series of experiments, rabbits were again used, and the previously infected groin was irradiated. The other groin was used as a control; it was irradiated with the same dose, but no inflammation had been induced. The doses in each animal varied from 2,000 to 600 to 250 roentgens. A third group of rabbits were not irradiated, but the groins were infected by the subcutaneous injection of the same foreign substance.

Spindle-cell sarcoma appeared in 5 of the 8 rabbits which had received a dose of 2,000 or 600 roentgens over a period of from twenty-four to forty-eight months. The control animals showed no cancer. Two rabbits developed tumors, but not at the irradiated site. No cancer was seen in the animals receiving 250 roentgens, nor in those which had not been irradiated, but which had been injected with the foreign substance. Adenocarcinoma of the uterus was seen in 7 of the 24 rabbits which survived the irradiation for a period of six months. Cancer of the breast was seen in 1 case.

Guinea pigs also were used, but the early mortality was high and the experiments were unsuccessful

MAURICE D. SACHS, M.D.

RADIUM

Cutler, M.: Cancer of the Larynx: A Radiotherapeutic Test as an Aid in Choosing Between Operation and Irradiation. *Arch. Otolar.*, Chic., 1944, 39: 53.

From the point of view of treatment, carcinoma of the larynx may be divided into 5 clinical groups: (1) inoperable lesions; (2) operable early lesions suitable for laryngofissure or radiotherapy; (3) operable lesions too advanced for laryngofissure or radiotherapy but suitable for laryngectomy; (4) lesions too advanced for laryngofissure but suitable for either laryngectomy or radiotherapy; and (5) lesions in which radiotherapy is preferable to laryngectomy for various reasons such as advanced age, poor life expectancy, or a psychological state adverse to laryngectomy.

In groups 4 and 5, often a clear choice between a surgical and a radiotherapeutic procedure becomes quite difficult. Two important questions arise: (1) Is it feasible to administer a complete course of radiotherapy and resort to laryngectomy if the disease persists or recurs? (2) Is it feasible to test the radiosensitivity of the carcinoma by a partial course of radiotherapy and to perform laryngectomy in the resistant cases later?

In connection with the first question, the author publishes the results obtained in 4 cases which are tabularly arranged according to the type of carcinoma, the amount of roentgen therapy, the interval between the last roentgen treatment and laryngectomy, and the postoperative course. In all 4 cases, the lesions were too advanced for laryngofissure but not beyond cure by laryngectomy. Following the full series of radiation therapy, no special technical difficulties were encountered at the operation which could be attributed to the radiation therapy. The healing was perhaps a little slower, but in the end a good scar was obtained. This confirms the observations of Brunschwig who, in performing pan-laryngectomy following irradiation, likewise encountered no operative or postoperative complications due to previous irradiation.

In connection with the second question, the author found the radiotherapeutic test to be of distinct value in those instances in which a decision between operation and irradiation is otherwise difficult. In 1941, the author introduced the so-called "interrupted

method" of irradiation for the treatment of the carcinomas of the mouth, pharynx, and larynx, which consists of two series of roentgen therapy separated by an interval of from eleven to fifteen days. In applying the radiotherapeutic test, the first series of treatment with the use of this method is given as usual. At the end of twenty-one days from the beginning of the treatment, or fifteen days from the time of the last treatment, it is possible to estimate the relative radiosensitivity with reasonable accuracy. If the carcinoma responds favorably, the second series of radiotherapy is administered; if there is little or no response, laryngectomy is performed from four to six weeks later. T. LEUCUTIA, M.D.

MISCELLANEOUS

Snow, W. B.: The Relation of Physical Therapy to Arthritis. *N. England J. M.*, 1943, 229: 959.

The author briefly discusses arthritis in a general way and emphasizes the need for accurate diagnosis preceding treatment. Such governing factors as psychological status and possible associated constitutional ailments have an important bearing and may well influence the advisability or limitation of physical therapy in a given case.

The various modalities available include moist or dry heat, massage, passive movement, manipulative procedures and therapeutic exercises, rest and restriction of activity, ultraviolet rays, various electrical applications, and exercise. The indications for physical therapy in arthritis are as follows: to improve the general condition, to reduce joint swelling, to relieve pain, to improve function, and to preserve function and lessen deformity. It should not be used for its psychological effect or as a sign to the patient that something is being done for him.

From the viewpoint of physical therapy, arthritic patients may be divided into six classes: those with rheumatic fever, septic arthritis, gonococcal arthritis, gouty arthritis, rheumatoid arthritis (atrophic), and osteoarthritis (hypertrophic). The management of each of these groups including appropriate physical-therapy procedures is given detailed consideration.

The author's summary and conclusions are as follows:

Physical therapy has a distinct place in the treatment of various forms of arthritis.

The use of physical therapy varies with different types and in different stages of arthritis.

When physical therapy is prescribed, the routine should be rational.

Physical therapy should not be prescribed promiscuously or be continued indefinitely when prescribed.

The physical therapy must be done by skilled technicians who are familiar with the disease that they are treating.

Care should be taken that the patient does not get a false impression that physical therapy will cure his arthritis, except in the case of neisserian arthritis.

Injudicious physical therapy may be a large factor in complicating an arthritis with a superimposed neurosis. A. HARTUNG, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

White, J. C., and Warren, S.: Causes of Pain in Feet after Prolonged Immersion in Cold Water. *War Med.*, Chic., 1944, 5: 6.

The most common complaint made by survivors of torpedoed vessels who have been submitted to prolonged immersion of their legs and feet in cold water is pain in the areas which have been submerged. The pain begins as soon as the feet are warmed after rescue and the benumbing effect of cold is dissipated.

The early burning throbbing sensation of pain develops with the onset of hyperemia and congestion provided the sensory nerves in the subcutaneous tissues have not been too severely injured. With the latter type of injury, in which it takes some days for partial recovery of sensation, the symptom develops as soon as pinprick can be felt in the proximal portion of the foot. Return of sensation to the toes may require several weeks, but this degree of recovery is not necessary. During the hyperemia stage, which lasts approximately a fortnight after the immersion in cold water, the surface temperature of the injured feet rises to the maximum vasodilatation level, from 90 to 95 degrees (from 10 to 15 degrees above the normal cutaneous temperature of this region of the body in a room at 70°F). A fundamental law of physical chemistry states that chemical reactions more than double their rate for each rise in temperature of 10°C (18°F); therefore, oxidative reactions in the tissues in the superheated cutaneous areas must be nearly doubled. In spite of the overactive circulation through the deeper layers, which have not been so severely injured by the cold, the subcutaneous circulation at this stage is greatly reduced. This is shown by the cyanotic hue of the skin with multiple petechial hemorrhages from ruptured capillaries and by the rapid blanching which takes place on elevation of the feet and their congestion when dependent. There must, therefore, be a great discrepancy between the supply of and the demand for oxygen, which results in anoxia of the superficial nerve endings and hence in pain. The explanation of the effective alleviation of this symptom by therapeutic cooling of the skin to below 80°F lies in the fact that the demand for blood on the part of the epithelial and subcutaneous tissue cells, and nerve endings is reduced and made commensurate with the supply. Improved color of the skin and the absorption of blister fluid are proofs of this contention.

The hyperemia of the deeper tissues is due to a sterile inflammatory reaction and tends to disappear after from ten to twenty days. In cases of wider injury pain diminishes *pari passu* with the return of normal circulation, but in the more severely injured extremities this is, unfortunately, not the case, and surface cooling no longer has its beneficial effect. One explanation of the pain in later stages is that an injured nerve is likely to be the seat of a painful neuritis until its regeneration is complete or nearly so. However, incapacitating pain may persist after recovery of the sensory nerves and it may be troublesome up to six months or longer. This type of pain is felt chiefly as a deep plantar ache on attempts to bear weight and it is aggravated by flexing the toes.

The authors were impressed by the fact that men who suffered prolonged immersion all had unusually stiff and rigid toes. All confirmed the fact that their ability to flex and extend the toes had been greatly reduced as a result of their exposure. In 1 case a diagnosis of hallux rigidus was made as a result and a corrective operation was undertaken. At operation there was extreme fibrosis of the subcutaneous tissue. As a result the authors removed biopsy specimens of the skin, subcutaneous tissue, and extensor brevis digitorum muscle of 6 patients. These biopsies all showed extreme fibrosis of the subcutaneous tissue and muscle, with compression of the finer nerve endings and infiltration of the larger trunks.

Six cases are reported and the suggestion is made that the contractions of scar tissue around the nerve endings and in the larger nerve trunks is the explanation for the persistent late pain in immersion foot.

The outstanding feature of the biopsies was a striking increase in the intercellular fibrous tissue, which had been almost entirely in the collagen. The number of fibroblasts was apparently not particularly increased and the elastic tissue, as demonstrated by the Weigert skin, was not unusual in either character or amount. The increase in collagen did not resemble that of a keloid, although there was, particularly in the subcutaneous tissue, some degree of hyalinization. In the corium the increased fibrosis was associated with some smoothing of the rete pegs and indistinctness of the basement membrane and the cutaneous appendages were less frequent than usual. Occasionally, telangiectases were present, particularly in the superficial layers of the corium. The arterioles and venules showed partial to almost complete occlusion as a result of a great increase of the fibrous tissue in their walls. The arteries and veins of large caliber showed the same type of fibrous thickening of the wall, but with a lesser degree of occlusion of the lumen.

The nerves were imbedded in this fairly dense fibrous tissue. Some of them showed edema as well and a few still showed a slight degree of wallerian degeneration thirteen weeks after exposure. In the large nerve trunks there was not only peripheral fibrosis, but increase in the endoneural fibrous tissue as well. It is probable that the bulk of the shrinkage of collagen occurred within from six to eight months after deposition. Consequently, if pain was due to nerve pressure because of contraction of the collagen, it should have been mitigated after this period of time. Biopsy of the muscles showed an easily appreciable

fibrosis, which extended about individual muscle fibers and groups of fibers. Also, there was appreciable atrophy of a number of muscle fibers, some of them using less than one-fourth of their normal diameter.

In cases of severe frostbite, gangrene resulted from the formation of ice crystals in the tissues, with rupture of the cellular membrane. As this did not occur at temperatures above the freezing point of sea water, massive gangrene did not develop in patients with immersion foot in the absence of complicating sepsis. However, in some cases there was extensive cellular damage of the superficial tissues with replacement of the injured cells by scar tissue.

Blackwood describes biopsies from the interdigital nerves of the foot from two and one-half to four months after exposure and from the lower limbs in which gangrene and sepsis had been present, amputated four and eleven months after rescue. The interdigital nerves showed almost complete wallerian degeneration and no significant vascular change. The tissues of amputated limbs showed a persistent edema. The main nerve trunks showed severe degeneration and early regeneration; in the large arteries there was slight intimal and medial fibrosis and in the large veins, patchy organized recanalized thrombosis. The muscles showed degenerative changes more severe than those following denervation.

Pain in the late cases lasts for months and subsides only when fibrous tissues cease to contract.

Although there is no effective treatment once the fibrosis has developed, the authors believe that much can be accomplished in the way of prevention. Suggestions for minimizing injury to the tissues from immersion have already been made by White. During the early phase of sterile inflammation and hyperemia, it is obviously of prime importance to control anoxia of the skin and subcutaneous tissue as effectively as possible. If the legs are allowed to warm too quickly, the consumption of oxygen by the more superficial cells, which have been most severely chilled, will far exceed the delivery of oxygen through the damaged blood vessels. Such a discrepancy between demand and supply leads to a prolonged period of anoxia and gradual death of the cells from asphyxia and their replacement by connective tissue and collagen. Much of this injury is likely to occur in the early period of recovery, where the skin is blistered and cyanotic. Artificial cooling reduces the degree of cutaneous anoxia by lowering cellular metabolism. Its effectiveness has been demonstrated by the reduction of cyanosis and absorption of blister fluid. The authors believe that efficient local cooling of the injured extremities throughout the early period of recovery and inflammation should do much to prevent fibrosis and the prolonged incapacity which may follow in its wake. LEROY J. KLEINSASSER, M.D.

Biermann, A. H., and Piszczek, E. A.: A Case of Poliomyelitis in a Newborn Infant. *J. Am. M. Ass.*, 1944, 124, 296.

A case of poliomyelitis is reported in detail by the authors. The mother died of the disease, and the infant which was born during the early stages of the mother's sickness showed signs of poliomyelitis on the eleventh day of its life. The question arose (since the infant lived) as to when the infant had been exposed to the disease. The following possibilities were considered:

Fetal infection. This question has been studied thoroughly, and it is believed that failure of the disease to develop in the fetus of a mother with acute poliomyelitis is due to the low concentration of the virus in the blood stream, or to its absence.

Birth-canal exposure. Harmon, Paul and Trask, Howe and Bodian, and numerous other workers in the poliomyelitis field have shown the presence of poliomyelitis virus in the feces of a high percentage of poliomyelitic patients during the early stages of the disease. Despite modern asepsis, contact between the mother's feces and the newborn child is possible at the time of birth.

Contact exposure. Four hours after birth, in accordance with the practice in hospitals, the infant had a ten-minute contact with the mother while the latter was in the early stages of the disease. There is no record of the intimacy of this contact, but it is possible that either buccal, nasal, or rectal-secretion contact may have been possible between the mother and the child.

Other contact exposure. It has been shown by Langmuir and by Piszczek, Shaughnessy, Zichis and Levinson, and others that a high percentage of persons in contact with cases of poliomyelitis may become carriers of the disease, especially during a time when there is a high community prevalence of the disease. Other persons who came in contact with the newborn infant in the case reported may have been carriers of the disease.

In the absence of laboratory evidence of contacts of the child with the poliomyelitis virus other than that with its mother, it was, of course, impossible to determine the source of the infant's infection; however, it appeared to the authors that the available evidence would suggest that infection occurred at the time of birth or shortly thereafter.

JOHN J. MALONEY, M.D.

Hettig, R. A., and Sturgis, C. C.: Sulfadiazine Agranulocytosis. *J. Michigan M. Soc.*, 1943, 42: 959.

Two cases of sulfadiazine agranulocytosis are presented. A third case, previously reported by Levin and Bethell, is included for purposes of analysis.

All 3 cases were undoubtedly caused by the chemotherapeutic agent, although no blood studies were made on the second case before use of the drug.

In the patients presented, agranulocytosis appeared after sulfadiazine had been administered for a prolonged period of time. The total amount injected was in excess of 70 gm. in each case. Small daily doses did not eliminate the danger of agranulocytosis since 1 of the patients received only 2 gm. daily. None of the patients had received previous sulfonamide therapy.

TABLE I.—RÉSUMÉ OF CASES REPORTED

Sex Age	Reason for Sulfadiazine Therapy	Total Dosage	Duration of Therapy	Leucocyte Count			Sternal Marrow	Treatment
				Before Treatment	Minimum	Terminal		
M 80	Urinary retention and incontinence. Inlying catheter. Prophylactic treatment	76 gm.	38 days	8,350 (80% PMN)	750 (0% PMN)	5,300 (80% PMN)		Transfusion Pentnucl.
F 54	Pharyngitis Chills and fever	74 gm.	22 days	—	850 (0% PMN)	1,900 (0% PMN)	Hypoplastic, maturation arrest at promyelocyte stage	Transfusion Pentnucl. Yellow bone marrow extract.
M 70	Incarcerated hernia. Pulmonary consolidation	76 gm.	19 days	5,350	850 (2% PMN)	750 (2% PMN)	Maturation arrest at myelocyte stage	Transfusion Pentnucl.

The usual therapeutic measures for agranulocytosis had no favorable effect on the course of the illness.

The authors urge that frequent observations of the total leucocyte count and the differential formula be made whenever sulfadiazine is used for more than a two-week period, even though it is given in small daily doses, and whenever the total dosage exceeds from 25 to 30 gm.

The possible relation of vitamin deficiencies to the syndrome is briefly presented. The authors propose the theory, namely, that a vitamin deficiency acts as a "conditioning mechanism" and renders persons more susceptible to certain drugs. Since this syndrome was described only twenty years ago, they believe that it is a plausible interpretation of the occurrence of agranulocytosis because there is evidence which indicates that the least mild degrees of vitamin deficiency, especially those due to a decreased intake of the B complex, are more prevalent now than previously.

The first case reported gave definite evidence of pellagra and in the second the patient had experienced a loss of 25 lb. of body weight as a result of an anti-obesity diet.

This possible etiological relationship is suggested in the hope that more patients who develop the syndrome of agranulocytosis will be studied from the standpoint of vitamin deficiencies.

DWIGHT E. CLARK, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Altemeier, W. A.: The Bacteriology of Traumatic Wounds. *J. Am. M. Ass.*, 1944, 124: 413.

The organisms found in wounds caused by trauma are roughly divided into three groups: (1) sporulating microbes of fecal origin, consisting mostly of the gas-gangrene-producing organisms, (2) nonsporulating microbes of fecal origin, including the enterococcus, bacillus coli, and other gram-negative bacilli, and (3) pyogenic cocci, chiefly the staphylococci and the streptococci. All traumatic wounds are contaminated, either at the time of infection, or sometime afterward. During the period of contamination the more common types of pathogenic organisms found are: (1) hemolytic staphylococci, (2) hemolytic, green-producing and nonhemolytic streptococci, (3) enterobacilli, and (4) the anaerobic sporulating gram-positive bacilli commonly causing gas gangrene and tetanus.

The interval of time that separates a contaminated wound from an infected one represents the period of incubation for the bacteria present in the wound, and ranges from four to twelve hours. Its duration varies with such factors as the virulence and rate of growth of the micro-organisms, the location and nature of the wound, the general condition of the patient, and the presence of systemic diseases, particularly diabetes. Traumatic wounds which do not receive treatment generally become infected, and the most serious infections are tetanus, gas gangrene, and pyogenic infections. Clostridial bacteria play the most important part in the early stage of infection, and conditions being favorable, gas gangrene or tetanus may develop. The primary infection disappears about the second week after injury in open wounds, and the fecal group of organisms is replaced by the staphylococci, the streptococci, and pyocyaneus organisms. These organisms may persist until healing takes place.

The most important sources of bacteria producing primary contamination and infection are soil, clothing, skin, hair, and various other foreign bodies. Bacteria of various kinds are transient on the skin surface, while in the deeper layers various cocci may become resident and be carried into the wound at the time of infection. Evidence indicates that secondary infection by pyogenic cocci, acquired during the period of hospitalization, is principally of human origin, the sources including the respiratory tract of the patient and of all those handling the wound, dust in the hospital, unsterile dressings and instruments, and discharges from other patients' wounds transferred by soiled hands and utensils. To mini-

mize this secondary infection various procedures have been devised; they include the early application of sterile first-aid dressing without probing of the wound, masking of both the patient and the medical personnel during dressings, the use of oil on ward floors to eliminate dust during sweeping, and careful aseptic dressing technique designed to prevent the mechanical transfer of pyogenic infection from one wound to another, as well as dust and air droplet contamination.

The important factors in the development of infection include the virulent type of contaminating bacteria; the nature, duration, and location of the wound; the presence of foreign bodies; the general condition of the patient; and the type and thoroughness of treatment.

To prevent primary infection of the wound, débridement has replaced the use of wound disinfectants. The success of primary débridement is dependent on the observation of well known principles of surgical therapy: (1) removal of all foreign bodies and devitalized tissue within the first six or eight hours; (2) suture of tissues without tension and with a minimum amount of buried ligatures and sutures; (3) maintenance of an adequate blood supply; and (4) apposition of live tissue to live tissue for the promotion of healing.

The local and general use of sulfanilamide and other chemotherapeutic agents has so far failed to decrease the incidence of local infection in soft-tissue wounds. The general administration of the sulfonamides, particularly sulfadiazine, to wounded patients is indicated for its localizing action on any developing infection, and its prevention or attenuation of postoperative pneumonia. The type of treatment, the time of its institution, and the skill of its administrator largely determine the effective prevention of wound infection.

EDWIN J. PULASKI, M.D.

DUCTLESS GLANDS

Means, J. H.: The Nature of Graves' Disease with Special Reference to Its Ophthalmic Component. *Am. J. M. Sc.*, 1944, 207: 1.

The author divides Graves' disease into the classic type and the special ophthalmopathic type. In the classic type, thyrotoxicosis and eye involvement are both present, and as the disease progresses the intensities of the two vary in parallel. Furthermore, in the classic type, the thyrotoxicosis is, from the therapeutic point of view, the major consideration. If it is relieved, the eye condition usually improves without special treatment. In the special ophthalmopathic type, on the other hand, the ophthalmopathy in its progression seems divorced or dissociated from the thyrotoxicosis; and from the therapeutic point of view the eyes, not the thyrotoxicosis, provide the chief indication for treatment.

Graves' disease is a breakdown of that balance of hormonic action which is necessary to the maintenance of health. There is an interrelationship between the pituitary gland in the form of a thyroid-stimulating hormone and there are changes in the thymus, the musculature, and in the lymphatic and reticuloendothelial systems as well. Seemingly, the malady is determined, to some degree, by an inherited constitution, plus, very likely, some environmentally imposed stress which the given constitution cannot take without departing from the healthy state.

The thyroid gland is under abnormal stimulation. In many instances, it delivers to the blood stream an excess of its hormone and hyperthyroidism results. This is clinically manifested by the symptoms of thyrotoxicosis, an increased metabolic rate, and elevation of the protein-bound iodine in the blood. Histologically it is manifested by a high columnar epithelium. There appears to be a "pituitary-thyroid axis" which usually remains balanced. The behavior of the thyroid is very likely secondary to humoral stimulation from the anterior pituitary lobe. The overactivity of the pituitary gland may well be due to a nervous impact reaching it via the hypothalamus. It looks as though thyroid-stimulating hormone affects the thyroid cell by acting as a catalyst on its oxidative enzyme system. There is evidence of an increased flow of the hormone which stimulates the thyroid, an increased avidity of the thyroid for iodine (a necessary ingredient of its hormone), and an increased flow of thyroid hormone which inhibits the pituitary gland.

The ophthalmic component of Graves' disease is an affliction of the extraglobal orbital contents, not primarily of the eyeball. The eyeball is pushed forward and its membranes are engorged because of what is going on behind it in the orbit; and the muscles controlling it, and the eyelids, or both, are the seat of pathological alteration. Early the only detectable abnormality may be a staring expression of the eyes and lid lag. The staring look is due to the widening of the palpebral fissure, Dalrymple's sign, with exposure of the white of the eye above the iris. It is believed that the sympathetic system has little, if anything, to do with any of the ophthalmic manifestations of Graves' disease.

At the onset of Graves' disease, the thyrotoxic or the ophthalmic manifestations may be the first to appear, or the two may appear together. Many of the patients complain of their eyes first. There may be poor convergence, or Moebius' sign. As the disease progresses the ophthalmic picture may develop in various ways. In addition to lid retraction, proptosis may appear and increase in intensity. The finding of bilateral eye signs of the Graves' variety is overwhelming evidence in favor of that diagnosis. The eyes have a sore and swollen look. The lids are edematous, the conjunctivae are injected and chemotic, and there will be tearing, smarting, photophobia, and so forth. This is quite different from the findings in the individual with classic Graves' disease in whom the proptosis may be marked, but there will be little lid retraction and no edema of the lids or conjunctivae, or congestion, and, probably, no ocular symptoms.

Whereas in the classic type of Graves' disease there is improvement of the ocular manifestations after thyroidectomy, in the cases which fall in the special ophthalmopathic group, the eye condition becomes aggravated after operation and the progress of the lesion may be such as to justify the appellation of malignant exophthalmos. It is, therefore, important not to do a thyroidectomy in this latter type when a truly terrible picture of bulging, inflamed eyes protruding through swollen lids is presented.

It seems established that a part of the immediate cause of exophthalmos in Graves' disease is swelling of the orbital contents. In the malignant cases, swelling of the muscles may be the chief factor. In others, edema of the other orbital contents may play a role. Weakness of the muscles with decreased back pull, is probably another—indeed, this may be the first to become operative.

The causes of these local changes, and what determines their prog ession or recession, are not clear. Certainly the changes are not the result of thyrotoxicosis per se. The thyroid is diuretic in action. It should decrease swelling, not cause it. Considerable evidence supports the view that an excess of thyrotropic hormone has something to do with the ophthalmic pathogenesis, but the relationship is probably not a simple one.

Why some cases follow the classic course, and others an ophthalmopathic one, may be related to differences in the response of the thyroid cells to the action of thyroid-stimulating hormone. In the classic type, TSH stimulates the cells, and they produce an excess of their hormone. In this process, TSH is inactivated and, as Rawson has shown, is excreted in that form in the urine. In the ophthalmopathic type, TSH is not inactivated to the same degree, the production of thyroid hormone is not increased and TSH is excreted in its active, as well as inactive form in the urine. At the same time, excess TSH aggravates the ophthalmic situation.

LEROY J. KLEINSASSER, M.D.

Shipley, R. A.: Treatment of Addison's Disease with Pellets of Desoxycorticosterone Acetate. *Am. J. M. Sc.*, 1944, 207: 19.

Desoxycorticosterone is the only adrenocortical steroid which has been prepared synthetically, and hence is the only pure cortical principle available in a quantity sufficient for therapeutic use. One of its disadvantages is the danger of overdosage with edema, hypertension, cardiac failure, and paralytic states.

Despite its shortcomings, this crystalline compound offers the unique advantage that it may be compressed into pellets, which, when implanted subcutaneously, give up the hormone to the tissues slowly and evenly, so that therapeutic effects may be sustained for many months.

The present report includes observations made on 7 patients with Addison's disease who have received treatment with pellets of desoxycorticosterone acetate. The pellets were inserted in the infrascapular region through an incision about 1 cm. long and were placed in the subcutaneous incision at various angles; as many as 6 pellets were inserted through one incision. The optimal dose was considered to be the amount of hormone which, without signs of overdosage, maintained normal levels of plasma chloride, blood urea nitrogen, hematocrit, and blood pressure, and which produced a maximum degree of subjective improvement with a moderate gain in weight.

Five of a series of 7 patients with Addison's disease were well maintained for from seven to forty months by pellets of desoxycorticosterone acetate and were able to carry on work involving moderate physical activity. The 2 other patients were not satisfactorily controlled either with pellets or with the compound administered by injection. Both of the patients died of the disease. One patient died suddenly after an attack of appendicitis at a time when he seemed to be convalescing satisfactorily.

Patients under therapy with pellets of desoxycorticosterone acetate may easily be thrown into hypoglycemia by fasting. The present results add confirmation to previous reports that desoxycorticosterone does not repair the defect in carbohydrate metabolism which is associated with adrenal insufficiency. These patients must therefore maintain an adequate intake of food.

During infection or other conditions imposing stress, the requirement for hormone is increased, and under these circumstances additional therapy, chiefly in the form of cortical extract, should be given.

The effectiveness of the 75 mgm. pellet which is being used lasts between nine and ten months, the average daily absorption is 0.21 mgm. per pellet, and the average number of pellets required is from four to six.

The patients in this series were implanted with pellets immediately after the period of diagnostic study. If within a few weeks or months there was no satisfactory degree of improvement, additional pellets were inserted. LEROY J. KLEINSASSER, M.D.

Kepler, E. J., Dockerty, M. B., and Priestley, J. T.: Adrenal-Like Ovarian Tumor Associated with Cushing's Syndrome (So-Called Musculino-Voblastoma, Luteoma, Hypernephroma, Adrenocortical Carcinoma of the Ovary). *Am. J. Obst.*, 1944, 47: 43.

The clinical and pathological data in the case which the authors reported in detail and in 13 additional cases previously reported in the literature are summarized. Certain features are deserving of special emphasis. Hirsutism was present in all 14 cases and varied in duration from nine months to thirteen years. A masculine pattern of distribution of hair usually was noted.

In 10 of the 14 cases the habitus was described as being of masculine type with pronounced development of the muscles of the shoulder girdle. In 8 of the 14 cases there was a definite and sometimes pronounced gain in body weight. Moreover, in the majority of the observed instances the "obesity" was

more or less localized to the face, cervical region, and pectoral girdle. In 4 cases, hypertension was present with systolic pressures in excess of 140 mm. or diastolic pressures of more than 90 mm. of mercury. In the case reported in detail, postoperative readings of the arterial blood pressure indicated a moderate drop in both systolic and diastolic pressures from distinctly high preoperative levels. This finding indicates that in some way the ovarian tumor was responsible for the observed arterial hypertension. Diabetes or a diabetic tendency was of relatively frequent occurrence, and hematological observations suggesting polycythemia vera were common.

From the pathological standpoint, all of the tumors have been unilateral with but 1 exception, in which both the right and left ovary equally shared the dubious honor of being host. Microscopically, the tumors were composed of large, pale, polyhedral, epithelial-like cells disposed in cords and anastomosing strands. Large amounts of intracellular lipoid material were noted in nearly all of the cases and intercellular glycogen was occasionally found to be present. In 12 of the 14 cases, the presence of ovarian tissue was demonstrated microscopically in the tumor capsule. In another case there was gross evidence of an ovarian point of origin.

The tumors under consideration were studied from three distinct angles; namely, (1) structure and histogenesis; (2) clinical manifestations, and (3) pathological physiology as shown by the presence of hormonal substances in the urine.

The authors stated that, like arrhenoblastomas, the adrenal-like ovarian tumors tend to masculinize their hosts but the tendency toward the production of bizarre type of fat distribution, the occurence of purplish striae, arterial hypertension, polycythemia, and so forth, relate them more closely to adrenocortical carcinomas from a "functioning" standpoint. Histologically, the tumors do not appear to arise through luteinization of pre-existing granulosa-cell neoplasms and an origin from adrenocortical "rests" seems more logical than does a derivation from the corpora lutea. An origin by way of teratomatous development likewise remains unproved. Some of the tumors appear to be cytologically malignant, and in 1 instance death resulted from metastasis.

EXPERIMENTAL SURGERY

Hellwig, C. A.: Goiter Heart: An Experimental Study. *Arch. Surg.*, 1944, 48: 27.

There has been no satisfactory explanation for the development of heart disease in patients with nontoxic goiter. The author produced, experimentally, simple goiter in white rats by goitrogenic diets to determine whether anatomic changes could be demonstrated in the hearts of these animals. Studies of the thyroid glands and hearts were also made in a control group.

No histological changes were found in the hearts of goitrous animals which would suggest a direct toxic effect of goiter on the myocardium. Lymphocytic infiltration, degeneration of the muscle fibers, and scar formation were common in the hearts of the experimental animals, but these changes were as often encountered in the hearts of the nongoitrous controls. The only positive anatomic finding was a significant hypertrophy of the left ventricle in the animals which received a calcium-rich diet. This observation suggests that left ventricular strain in endemic goiter may be due to a direct effect exerted on the heart muscle by the same factor which is responsible for the development of goiter: for instance, an excess of calcium in the food.

ERNEST E. ARNHEIM, M.D.

Lischer, C., Elman, R., and Davey, H. W.: Experimental Burns: Changes in Plasma Albumin and Globulin. *War Med.*, Chic., 1944, 5: 43.

Measurement of the albumin and globulin fractions of the plasma of dogs subjected to experimental burns showed striking differences in the behavior of plasma proteins which depended on the degree and extent of the thermal stimulus and on whether death or survival resulted. The burns were effected by immersing an animal in hot water for a certain number of seconds. This resulted in burns which showed only edema of the skin.

In such burns the changes in albumin and globulin vary with two factors, one of which is the resistance to the burn as indicated by the mortality, and the other, the degree of the burn stimulus. In a series of dogs in which 75 per cent of the body was subjected to burn stimuli at 75°C. for 5 seconds, 3 of 4 dogs died. Significant are the facts that the hemoconcentration was greater in animals that died and that the globulin rose while the albumin fell. The dog that survived showed a lower hemoconcentration and little damage in the albumin and globulin. With higher temperatures, the curves were much the same. When the temperature was raised to 90°C. and the body area cut down to 50 per cent, the curves resembled the fatal curves of the lower temperatures. In animals subjected to extreme heat (100°C.) the hemoconcentration may be masked by hemolysis.

JOHN W. EPTON, M.D.

Weinman, D., and Berne, R.: Therapeutic Cure of Acute Experimental Toxoplasmosis in Animals. *J. Am. M. Ass.*, 1944, 124: 6.

The disease toxoplasmosis is almost invariably fatal in man. Therapy has been unsuccessful. The principal cause for this failure may well be the short period in which the patients are available for treatment, since death often follows a few days after the appearance of the initial symptoms. Practically, therefore, decidedly beneficial results in man may be expected only from those drugs which, in animals, have experimentally been proved effective when administered during the acute disease and shortly before death.

Sulfapyridine has been found to be strikingly successful in curing acute toxoplasmosis in mice. The

earlier the treatment is started in the course of the disease, the higher is the recovery rate. When treatment is initiated at the expiration of one-third the period of expected survival, nearly all animals recover. If treatment is delayed beyond the end of the second third of this period, only half the animals survive. However, some animals are cured by sulfapyridine administered as late as three days before expected death.

Therapy cures the disease, but does not sterilize the infection. The cured mice remain carriers and retain virulent organisms in the brain.

The results reported appear to warrant the use of the sulfonamides in treating acute human toxoplasmosis. SAMUEL KAHN, M.D.

HOSPITALS; MEDICAL EDUCATION AND HISTORY

Propper-Grashchenkov, N. I.: Medical Science in the USSR in the Last Twenty-five Years. *Lancet*, Lond., 1944, 246: 61.

Propper-Grashchenkov traces the progress in Soviet medicine throughout the past twenty-five years, grouping his inventory in five-year periods. The first period begins after the October Revolution and witnessed the establishment of a large number of scientific institutes, laboratories, and faculties of medicine, and also the material basis of their existence.

The next five years saw a substantial increase in the activities which emphasized research. Young scientific workers were sent abroad to study and the standard of work in the laboratory rose to a high level. The prestige in medical science rose and international recognition was obtained during this period.

Following this, Soviet medicine became a powerful organization including a large number of scientific practical institutes, laboratories, and medical colleges.

The last five years including the war period has been one of flourishing medical science closely connected with the practical work of public health departments.

The number of hospitals and doctors have proportionately increased, so much so that there are now 500,000 hospital beds in the cities and 250,000 in the countryside. Dispensaries, polyclinics, and first-aid posts in the cities number nearly 100,000. To this is added 150,000 beds in the new maternity hospitals located in cities and villages.

There are now 180,000 doctors serving these activities and 100,000 students in the medical schools.

In 1941 there were 100 institutes for research with 10,000 scientific workers as compared with the 16 such schools that existed at the time of the Revolution.

The result of these achievements is best judged by the decrease in epidemics and infectious diseases, the lowering of infant mortality, and extension of normal life expectancy. Plague, cholera, smallpox, typhoid, paratyphoid, and dysentery were stamped out. Brucellosis and tularemia have been studied especially, whereas tuberculosis and venereal diseases have been subjected to an intense investigation and their incidence is encouragingly low. Trachoma has ceased to be a mass problem.

Soviet surgery, particularly neurosurgery, has reached an enviably high level. Psychiatry, in contradistinction to that in many Western-European schools, has based itself on the studies of Pavlov and his school of the physiology of higher nervous activity.

Occupational pathology has been studied, and numerous rest centers, sanatoria, and spas flourish throughout the country.

The other branches of basic sciences have kept apace with these developments, uninterrupted by the war; and so much so that, according to the author, medicine has flourished under the Soviet system of government. STEPHEN A. ZIEMAN, M.D.